Appendix A4

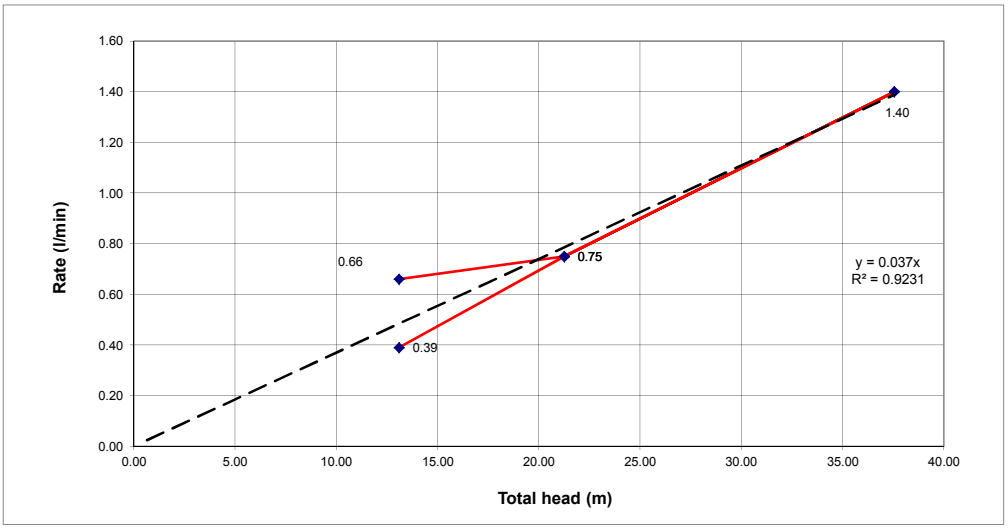
Packer Permeability Test Analysis and Results

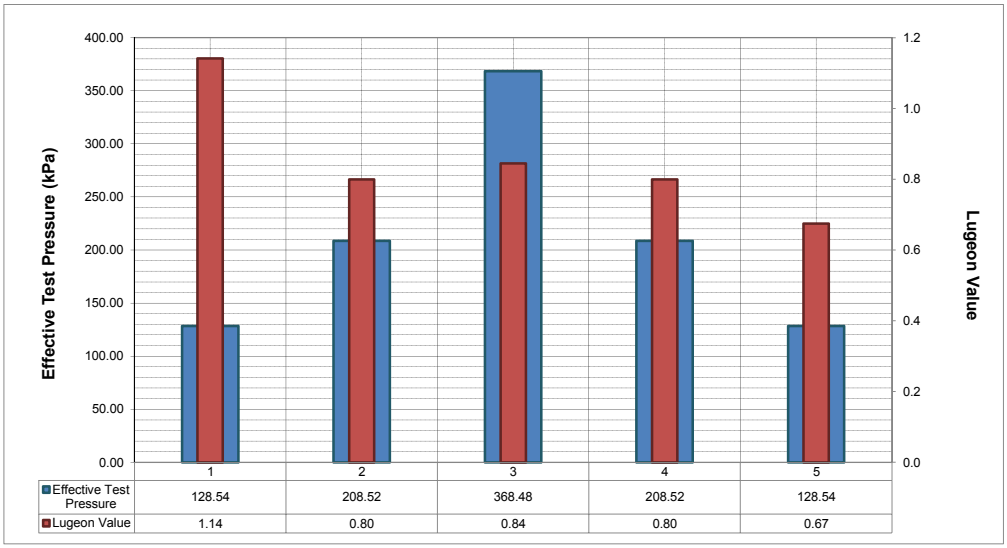
Packer (Lugeon) Test Analysis

Project Name:	*East West Link*	Client	*New Zealand Transport Agency*
Project No:	*4216210*	Borehole ID:	*BH4001*
Date:	*11/05/2016*	Initials:	*JM*
Hole Depth (m):	*10.5*	Hole Dia. (m):	*0.096*
Packer Depth (m):	*6*	Gauge Ht (m):	*0.9*
Test Length (m):	*4.5*	Static head (kPa)[1]	*48.6*
SWL (m bgl):	*4.05*	Contractor:	*McMillan Drilling Group*

Test Step	Length of Step (min)	Water Loss (litres)			Gauge Pressure		Net test pressure (kPa)[2]	Total Head (m)[3]	Water Injected			Lugeon value (Lu)[4]	Permeability (m/s)[5]
		Start	Finish	Total	PSI	kPa			Total Vol (l)	Rate (l/min)	Take (l/min/m)		
1	10	49340.6	49347.2	6.6	*11.6*	*80*	*128.54*	*13.10*	*6.6*	*0.66*	*0.15*	*1.14*	*1.3E-07*
2	10	49351.2	49358.7	7.5	*23.2*	*160*	*208.52*	*21.26*	*7.5*	*0.75*	*0.17*	*0.80*	*9.4E-08*
3	10	49361.8	49375.8	14	*46.4*	*320*	*368.48*	*37.56*	*14*	*1.40*	*0.31*	*0.84*	*1.0E-07*
4	10	49378.1	49385.6	7.5	*23.2*	*160*	*208.52*	*21.26*	*7.5*	*0.75*	*0.17*	*0.80*	*9.4E-08*
5	10	49387.3	49391.2	3.9	*11.6*	*80*	*128.54*	*13.10*	*3.9*	*0.39*	*0.09*	*0.67*	*8.0E-08*
6													
7													
8													

[1] Static head = (Gauge height + groundwater depth) x 9.81 (m head to kPa conversion)
[2] Net test pressure = gauge pressure + static head - friction losses. Note: frictional head losses considered to be negligible
[3] Total head = Static head + groundwater depth + (net test pressure / 9.81 (kPa to m head conversion))
[4] Lugeon value = (flow rate / length of test section) x (1000kPa reference pressure / net test pressure(kpa))
[5] Permeability = (5.9918e-8) x Lugeon value x LOG10(length of test section/borehole radius) (Richter and Lillich, 1975)





Flow Behaviour Type	**Laminar**	**Analysis Comment:**
Representative Lugeon Value	**0.85**	Lugeon values consistent across pressure range Representative Lugeon value = average value
Approximate Permeability (m/s)	**1.0E-07**	

NZ TRANSPORT AGENCY WAKA KOTAHI

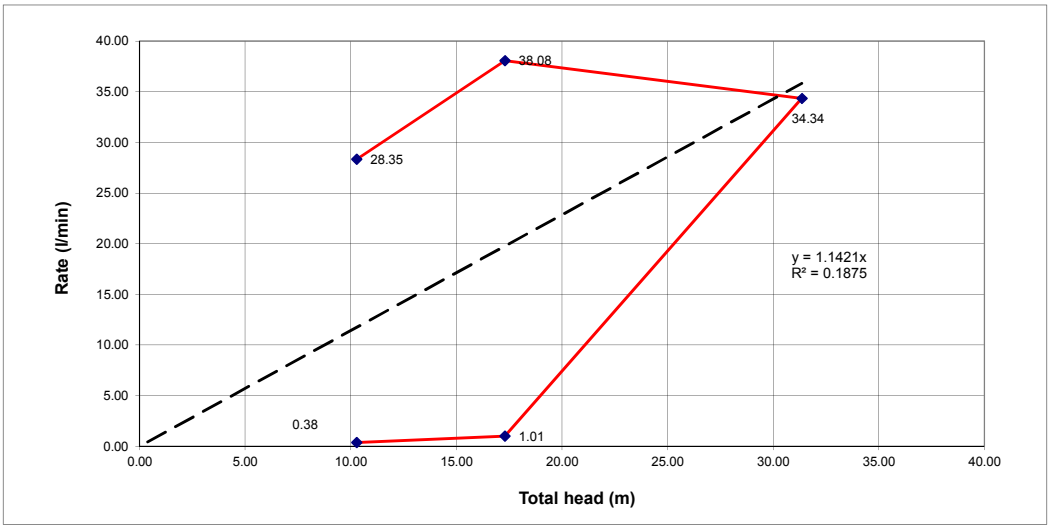
East West Link

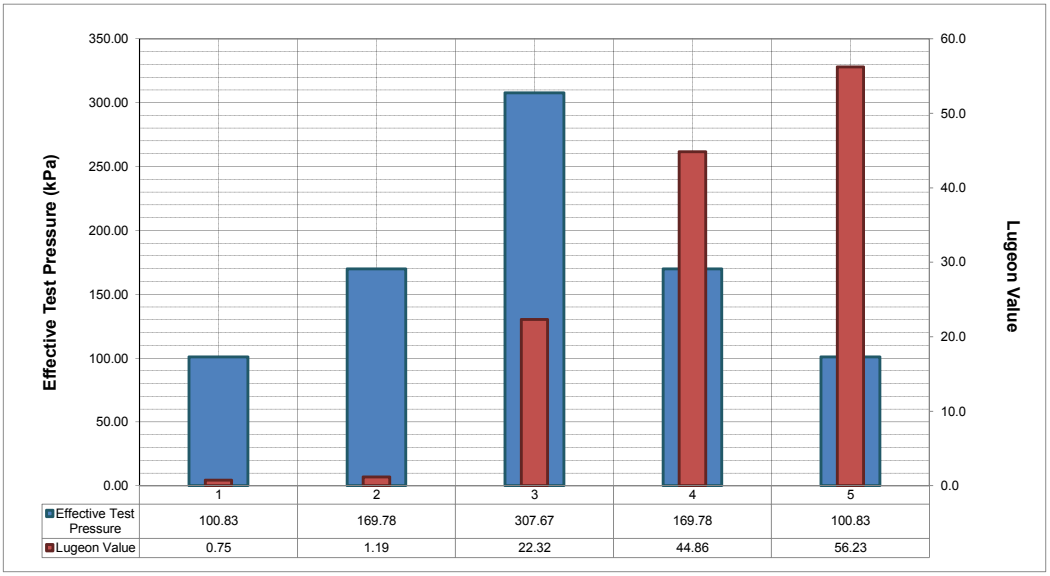
Packer (Lugeon) Test Analysis

Project Name:	*East West Link*	Client	*New Zealand Transport Agency*
Project No:	*4216210*	Borehole ID:	*BH4002*
Date:	*18/04/2016*	Initials:	*JWB*
Hole Depth (m):	*10.5*	Hole Dia. (m):	*0.096*
Packer Depth (m):	*5.5*	Gauge Ht (m):	*0.95*
Test Length (m):	*5*	Static head (kPa)[1]	*31.9*
SWL (m bgl):	*2.3*	Contractor:	*McMillan Drilling Group*

Test Step	Length of Step (min)	Water Loss (litres)			Gauge Pressure		Net test pressure (kPa)[2]	Total Head (m)[3]	Water Injected			Lugeon value (Lu)[4]	Permeability (m/s)[5]
		Start	Finish	Total	PSI	kPa			Total Vol (l)	Rate (l/min)	Take (l/min/m)		
1	10	27841.5	27845.3	3.8	*10*	*69*	*100.83*	*10.28*	*3.8*	*0.38*	*0.08*	*0.75*	*9.1E-08*
2	10	27851.3	27861.4	10.1	*20*	*138*	*169.78*	*17.31*	*10.1*	*1.01*	*0.20*	*1.19*	*1.4E-07*
3	10	27881.5	28224.9	343.4	*40*	*276*	*307.67*	*31.36*	*343.4*	*34.34*	*6.87*	*22.32*	*2.7E-06*
4	10	28281.0	28661.8	380.8	*20*	*138*	*169.78*	*17.31*	*380.8*	*38.08*	*7.62*	*44.86*	*5.4E-06*
5	10	28694.7	28978.2	283.5	*10*	*69*	*100.83*	*10.28*	*283.5*	*28.35*	*5.67*	*56.23*	*6.8E-06*
6													
7													
8													

[1] Static head = (Gauge height + groundwater depth) x 9.81 (m head to kPa conversion)
[2] Net test pressure = gauge pressure + static head - friction losses. Note: frictional head losses considered to be negligible
[3] Total head = Static head + groundwater depth + (net test pressure / 9.81 (kPa to m head conversion))
[4] Lugeon value = (flow rate / length of test section) x (1000kPa reference pressure / net test pressure(kpa))
[5] Permeability = (5.9918e-8) x Lugeon value x LOG10(length of test section/borehole radius) (Richter and Lillich, 1975)





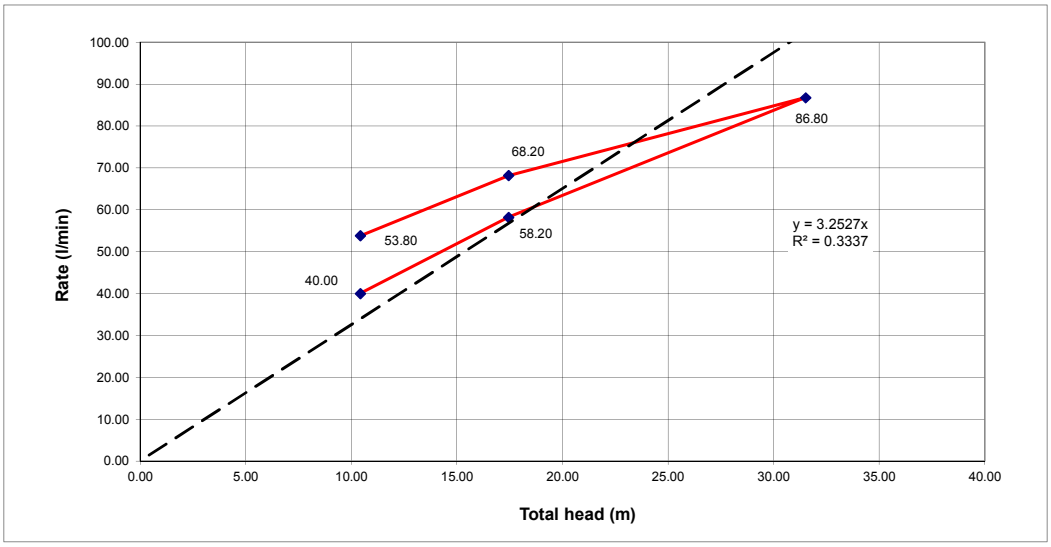
Flow Behaviour Type	**Washout**	**Analysis Comment:** Lugeon values increase as test proceeds
Representative Lugeon Value	**56.23**	Representative Lugeon value = maximum (Stage 5)
Approximate Permeability (m/s)	**3.0E-06**	

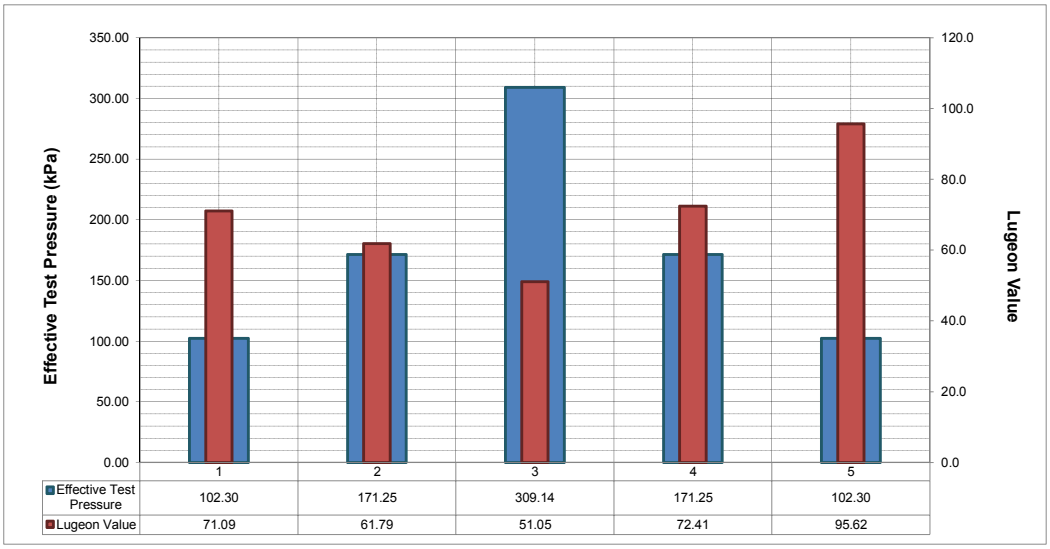
Packer (Lugeon) Test Analysis

Project Name:	*East West Link*	Client	*New Zealand Transport Agency*
Project No:	*4216210*	Borehole ID:	*BH4003*
Date:	*20/04/2016*	Initials:	*JWB*
Hole Depth (m):	*10.5*	Hole Dia. (m):	*0.096*
Packer Depth (m):	*5*	Gauge Ht (m):	*0.96*
Test Length (m):	*5.5*	Static head (kPa)[1]	*33.4*
SWL (m bgl):	*2.44*	Contractor:	*McMillan Drilling Group*

Test Step	Length of Step (min)	Water Loss (litres)			Gauge Pressure		Net test pressure (kPa)[2]	Total Head (m)[3]	Water Injected			Lugeon value (Lu)[4]	Permeability (m/s)[5]
		Start	Finish	Total	PSI	kPa			Total Vol (l)	Rate (l/min)	Take (l/min/m)		
1	10	31445.0	31845.0	400	*10*	*69*	*102.30*	*10.43*	*400*	*40.00*	*7.27*	*71.09*	*8.8E-06*
2	10	31900.0	32482.0	582	*20*	*138*	*171.25*	*17.46*	*582*	*58.20*	*10.58*	*61.79*	*7.6E-06*
3	10	32623.0	33491.0	868	*40*	*276*	*309.14*	*31.51*	*868*	*86.80*	*15.78*	*51.05*	*6.3E-06*
4	10	33587.0	34269.0	682	*20*	*138*	*171.25*	*17.46*	*682*	*68.20*	*12.40*	*72.41*	*8.9E-06*
5	10	34318.0	34856.0	538	*10*	*69*	*102.30*	*10.43*	*538*	*53.80*	*9.78*	*95.62*	*1.2E-05*
6													
7													
8													

[1] Static head = (Gauge height + groundwater depth) x 9.81 (m head to kPa conversion)
[2] Net test pressure = gauge pressure + static head - friction losses. Note: frictional head losses considered to be negligible
[3] Total head = Static head + groundwater depth + (net test pressure / 9.81 (kPa to m head conversion))
[4] Lugeon value = (flow rate / length of test section) x (1000kPa reference pressure / net test pressure(kpa))
[5] Permeability = (5.9918e-8) x Lugeon value x LOG10(length of test section/borehole radius) (Richter and Lillich, 1975)





Flow Behaviour Type	**Turbulent**	**Analysis Comment:** Lugeon values decrease aswater pressures increase. Min. Lugeon value occurs at max. water pressure. Representative Lu = average of Stage 2 and 4
Representative Lugeon Value	**67.10**	
Approximate Permeability (m/s)	**8.7E-06**	

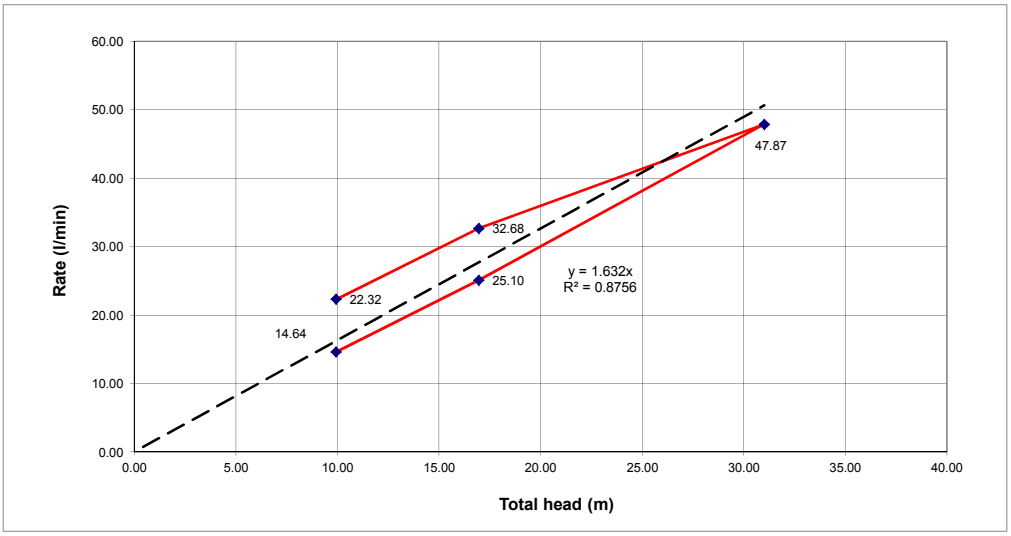
NZ TRANSPORT AGENCY WAKA KOTAHI
East West Link

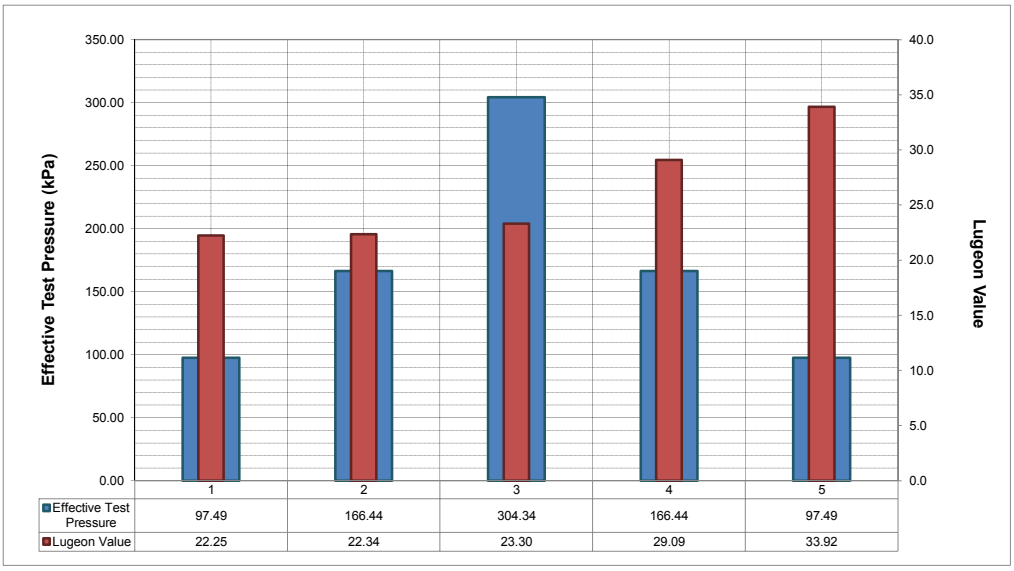
Packer (Lugeon) Test Analysis

Project Name:	*East West Link*	Client	*New Zealand Transport Agency*
Project No:	*4216210*	Borehole ID:	*BH4004*
Date:	*2/05/2016*	Initials:	*JWB*
Hole Depth (m):	*12.5*	Hole Dia. (m):	*0.096*
Packer Depth (m):	*5.75*	Gauge Ht (m):	*0.9*
Test Length (m):	*6.75*	Static head (kPa)[1]	*28.5*
SWL (m bgl):	*2.01*	Contractor:	*McMillan Drilling Group*

Test Step	Length of Step (min)	Water Loss (litres)			Gauge Pressure		Net test pressure (kPa)[2]	Total Head (m)[3]	Water Injected			Lugeon value (Lu)[4]	Permeability (m/s)[5]
		Start	Finish	Total	PSI	kPa			Total Vol (l)	Rate (l/min)	Take (l/min/m)		
1	10	39125.5	39271.9	146.4	*10*	*69*	*97.49*	*9.94*	*146.4*	*14.64*	*2.17*	*22.25*	*2.9E-06*
2	10	39324.3	39575.3	251	*20*	*138*	*166.44*	*16.97*	*251*	*25.10*	*3.72*	*22.34*	*2.9E-06*
3	10	39721.5	40200.2	478.7	*40*	*276*	*304.34*	*31.02*	*478.7*	*47.87*	*7.09*	*23.30*	*3.0E-06*
4	10	40268.4	40595.2	326.8	*20*	*138*	*166.44*	*16.97*	*326.8*	*32.68*	*4.84*	*29.09*	*3.7E-06*
5	10	40634.6	40857.8	223.2	*10*	*69*	*97.49*	*9.94*	*223.2*	*22.32*	*3.31*	*33.92*	*4.4E-06*
6													
7													
8													

[1] Static head = (Gauge height + groundwater depth) x 9.81 (m head to kPa conversion)
[2] Net test pressure = gauge pressure + static head - friction losses. Note: frictional head losses considered to be negligible
[3] Total head = Static head + groundwater depth + (net test pressure / 9.81 (kPa to m head conversion))
[4] Lugeon value = (flow rate / length of test section) x (1000kPa reference pressure / net test pressure(kpa))
[5] Permeability = (5.9918e-8) x Lugeon value x LOG10(length of test section/borehole radius) (Richter and Lillich, 1975)





Flow Behaviour Type	**Washout**	**Analysis Comment:** Lugeon values increase as test proceeds
Representative Lugeon Value	**29.09**	Representative Lugeon value = maximum (Stage 5)
Approximate Permeability (m/s)	**3.4E-06**	

NZ TRANSPORT AGENCY WAKA KOTAHI

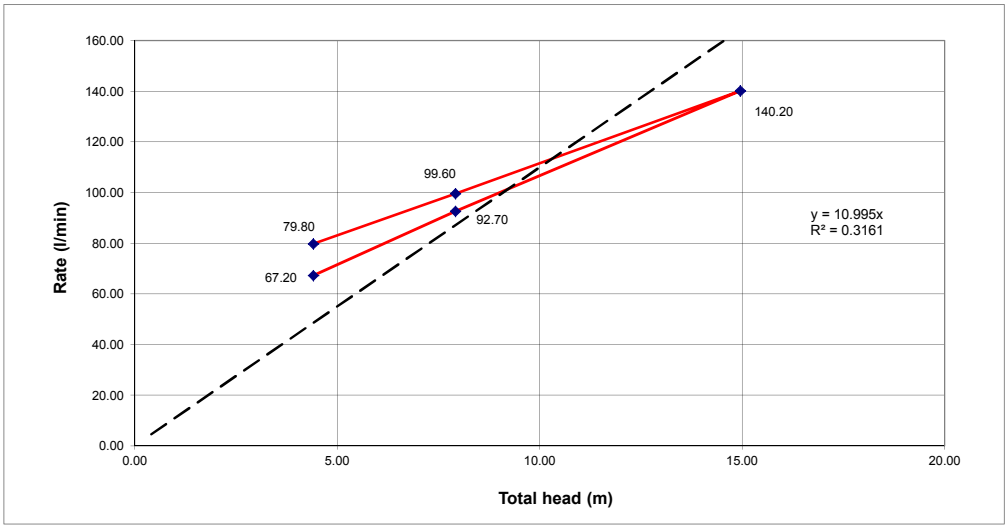
East West Link

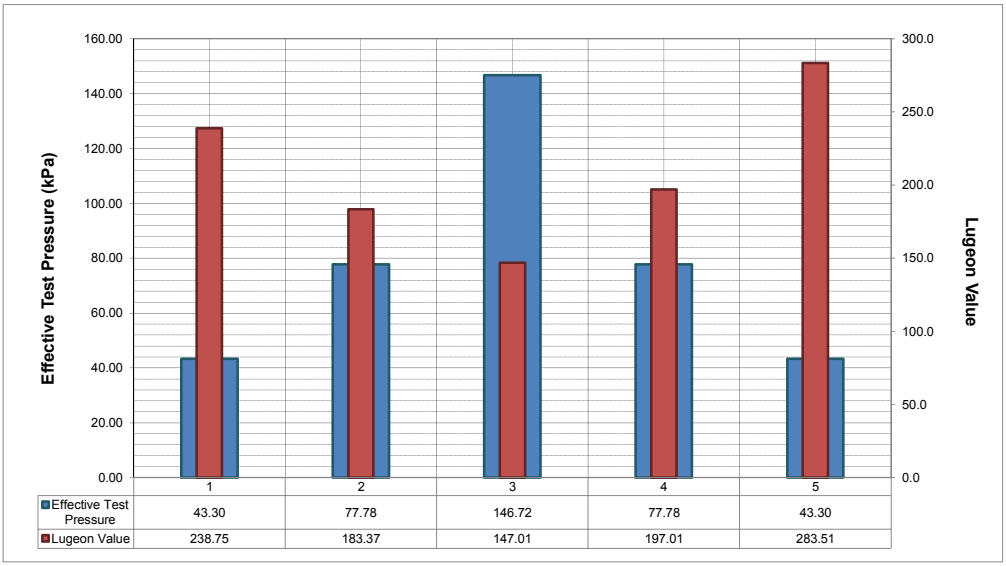
Packer (Lugeon) Test Analysis

Project Name:	*East West Link*	Client	*New Zealand Transport Agency*
Project No:	*4216210*	Borehole ID:	*BH4005*
Date:	*8/04/2016*	Initials:	*JWB*
Hole Depth (m):	*15*	Hole Dia. (m):	*0.096*
Packer Depth (m):	*8.5*	Gauge Ht (m):	*0.9*
Test Length (m):	*6.5*	Static head (kPa)[1]	*8.8*
SWL (m bgl):	*0*	Contractor:	*McMillan Drilling Group*

Test Step	Length of Step (min)	Water Loss (litres)			Gauge Pressure		Net test pressure (kPa)[2]	Total Head (m)[3]	Water Injected			Lugeon value (Lu)[4]	Permeability (m/s)[5]
		Start	Finish	Total	PSI	kPa			Total Vol (l)	Rate (l/min)	Take (l/min/m)		
1	10	22582	23254	672	*5*	*34*	*43.30*	*4.41*	*672*	*67.20*	*10.34*	*238.75*	*3.0E-05*
2	10	23294	24221	927	*10*	*69*	*77.78*	*7.93*	*927*	*92.70*	*14.26*	*183.37*	*2.3E-05*
3	10	24412	25814	1402	*20*	*138*	*146.72*	*14.96*	*1402*	*140.20*	*21.57*	*147.01*	*1.9E-05*
4	10	25861	26857	996	*10*	*69*	*77.78*	*7.93*	*996*	*99.60*	*15.32*	*197.01*	*2.5E-05*
5	10	26895	27693	798	*5*	*34*	*43.30*	*4.41*	*798*	*79.80*	*12.28*	*283.51*	*3.6E-05*
6													
7													
8													

[1] Static head = (Gauge height + groundwater depth) x 9.81 (m head to kPa conversion)
[2] Net test pressure = gauge pressure + static head - friction losses. Note: frictional head losses considered to be negligible
[3] Total head = Static head + groundwater depth + (net test pressure / 9.81 (kPa to m head conversion))
[4] Lugeon value = (flow rate / length of test section) x (1000kPa reference pressure / net test pressure(kpa))
[5] Permeability = (5.9918e-8) x Lugeon value x LOG10(length of test section/borehole radius) (Richter and Lillich, 1975)





Flow Behaviour Type	**Turbulent**	**Analysis Comment:** Lugeon values decrease as water pressures increase Min. Lugeon value occurs at max. water pressure Representative Lu = average of Stage 2 and 4
Representative Lugeon Value	**190.19**	
Approximate Permeability (m/s)	**2.7E-05**	

NZ TRANSPORT AGENCY WAKA KOTAHI

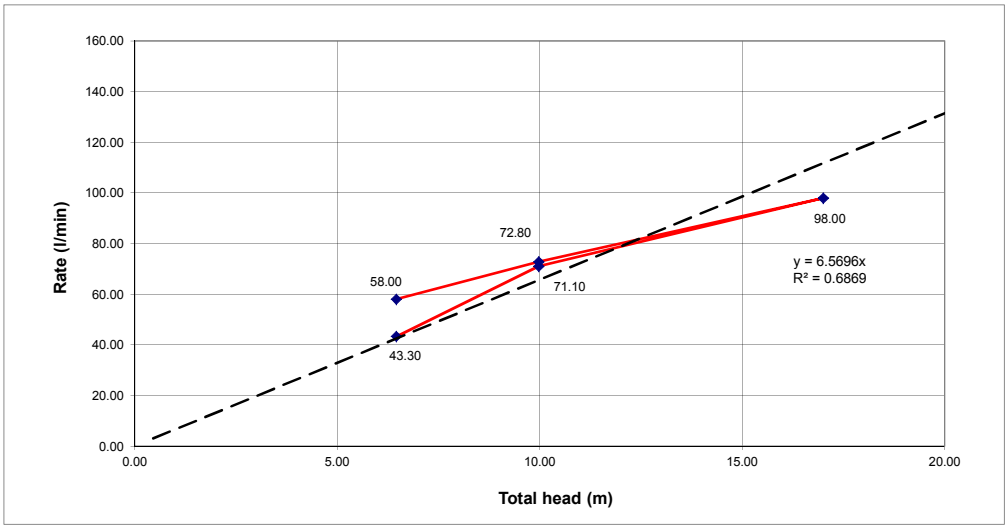
East West Link

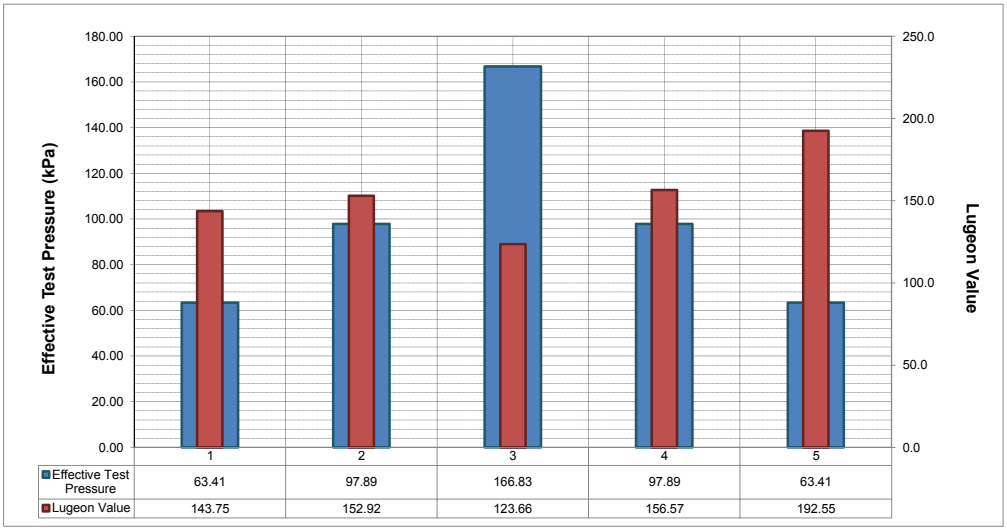
Packer (Lugeon) Test Analysis

Project Name:	*East West Link*	Client	*New Zealand Transport Agency*
Project No:	*4216210*	Borehole ID:	*BH4006*
Date:	*5/05/2016*	Initials:	*JWB*
Hole Depth (m):	*8.25*	Hole Dia. (m):	*0.096*
Packer Depth (m):	*3.5*	Gauge Ht (m):	*0.85*
Test Length (m):	*4.75*	Static head (kPa)[1]	*28.9*
SWL (m bgl):	*2.1*	Contractor:	*McMillan Drilling Group*

Test Step	Length of Step (min)	Water Loss (litres)			Gauge Pressure		Net test pressure (kPa)[2]	Total Head (m)[3]	Water Injected			Lugeon value (Lu)[4]	Permeability (m/s)[5]
		Start	Finish	Total	PSI	kPa			Total Vol (l)	Rate (l/min)	Take (l/min/m)		
1	10	41540	41973	433	*5*	*34*	*63.41*	*6.46*	*433*	*43.30*	*9.12*	*143.75*	*1.7E-05*
2	10	42200	42911	711	*10*	*69*	*97.89*	*9.98*	*711*	*71.10*	*14.97*	*152.92*	*1.8E-05*
3	10	43075	44055	980	*20*	*138*	*166.83*	*17.01*	*980*	*98.00*	*20.63*	*123.66*	*1.5E-05*
4	10	44225	44953	728	*10*	*69*	*97.89*	*9.98*	*728*	*72.80*	*15.33*	*156.57*	*1.9E-05*
5	10	45055	45635	580	*5*	*34*	*63.41*	*6.46*	*580*	*58.00*	*12.21*	*192.55*	*2.3E-05*
6													
7													
8													

[1] Static head = (Gauge height + groundwater depth) x 9.81 (m head to kPa conversion)
[2] Net test pressure = gauge pressure + static head - friction losses. Note: frictional head losses considered to be negligible
[3] Total head = Static head + groundwater depth + (net test pressure / 9.81 (kPa to m head conversion))
[4] Lugeon value = (flow rate / length of test section) x (1000kPa reference pressure / net test pressure(kpa))
[5] Permeability = (5.9918e-8) x Lugeon value x LOG10(length of test section/borehole radius) (Richter and Lillich, 1975)





Flow Behaviour Type	**Turbulent**
Representative Lugeon Value	**154.74**
Approximate Permeability (m/s)	**1.8E-05**

Analysis Comment:
Lugeon values decrease as water pressures increase
Min. Lugeon value occurs at max. water pressure
Representative Lu = average of Stage 2 and 4

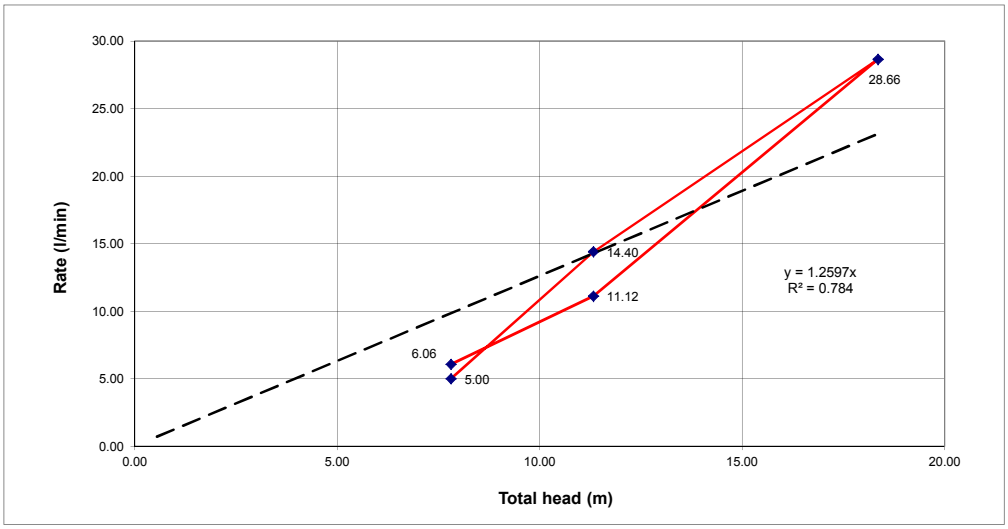
NZ TRANSPORT AGENCY WAKA KOTAHI
East West Link

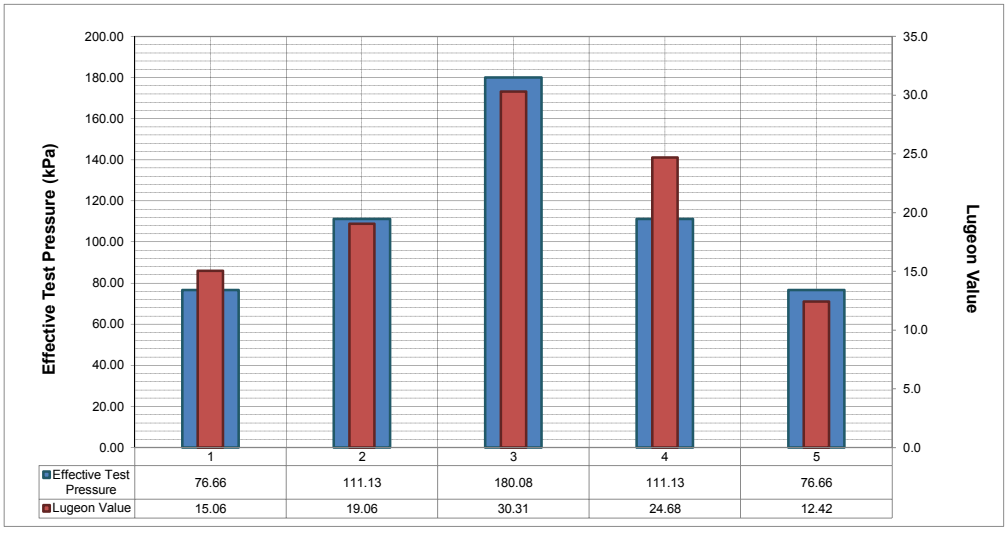
Packer (Lugeon) Test Analysis

Project Name:	*East West Link*	Client	*New Zealand Transport Agency*
Project No:	*4216210*	Borehole ID:	*BH4007*
Date:	*21/04/2016*	Initials:	*JWB*
Hole Depth (m):	*9*	Hole Dia. (m):	*0.096*
Packer Depth (m):	*3.75*	Gauge Ht (m):	*0.85*
Test Length (m):	*5.25*	Static head (kPa)[1]	*42.2*
SWL (m bgl):	*3.45*	Contractor:	*McMillan Drilling Group*

Test Step	Length of Step (min)	Water Loss (litres)			Gauge Pressure		Net test pressure (kPa)[2]	Total Head (m)[3]	Water Injected			Lugeon value (Lu)[4]	Permeability (m/s)[5]
		Start	Finish	Total	PSI	kPa			Total Vol (l)	Rate (l/min)	Take (l/min/m)		
1	10	34983.1	35043.7	60.6	*5*	*34*	*76.66*	*7.81*	*60.6*	*6.06*	*1.15*	*15.06*	*1.8E-06*
2	10	35062.3	35173.5	111.2	*10*	*69*	*111.13*	*11.33*	*111.2*	*11.12*	*2.12*	*19.06*	*2.3E-06*
3	10	35197.9	35484.5	286.6	*20*	*138*	*180.08*	*18.36*	*286.6*	*28.66*	*5.46*	*30.31*	*3.7E-06*
4	10	35518.1	35662.1	144	*10*	*69*	*111.13*	*11.33*	*144*	*14.40*	*2.74*	*24.68*	*3.0E-06*
5	10	35680.1	35730.1	50	*5*	*34*	*76.66*	*7.81*	*50*	*5.00*	*0.95*	*12.42*	*1.5E-06*
6													
7													
8													

[1] Static head = (Gauge height + groundwater depth) x 9.81 (m head to kPa conversion)
[2] Net test pressure = gauge pressure + static head - friction losses. Note: frictional head losses considered to be negligible
[3] Total head = Static head + groundwater depth + (net test pressure / 9.81 (kPa to m head conversion))
[4] Lugeon value = (flow rate / length of test section) x (1000kPa reference pressure / net test pressure(kpa))
[5] Permeability = (5.9918e-8) x Lugeon value x LOG10(length of test section/borehole radius) (Richter and Lillich, 1975)





Flow Behaviour Type	**Dilation**
Representative Lugeon Value	**13.74**
Approximate Permeability (m/s)	**2.5E-06**

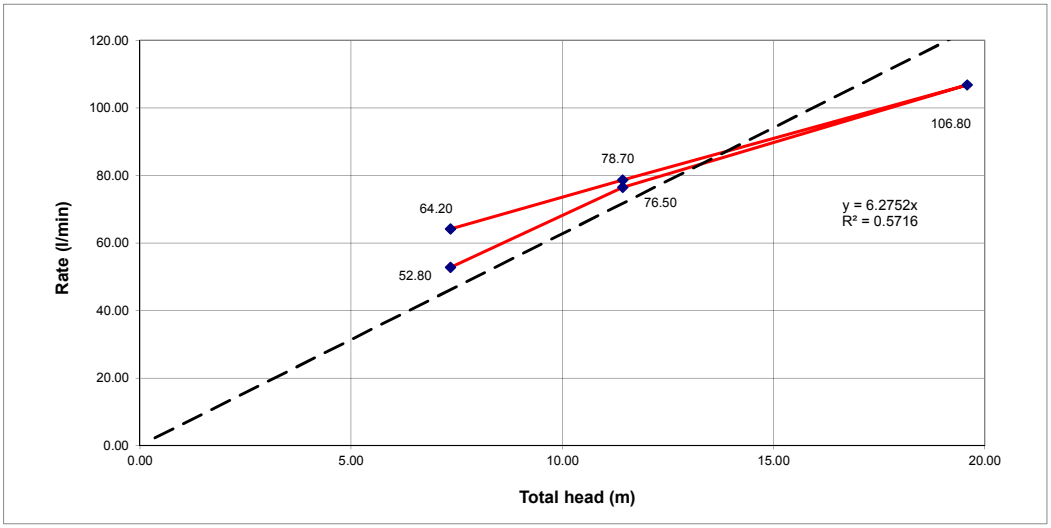
Analysis Comment:
Lugeon values vary proportionally to water pressures
Max. Lugeon value occurs at max. water pressure
Representative Lu = average of Stage 1 and 5

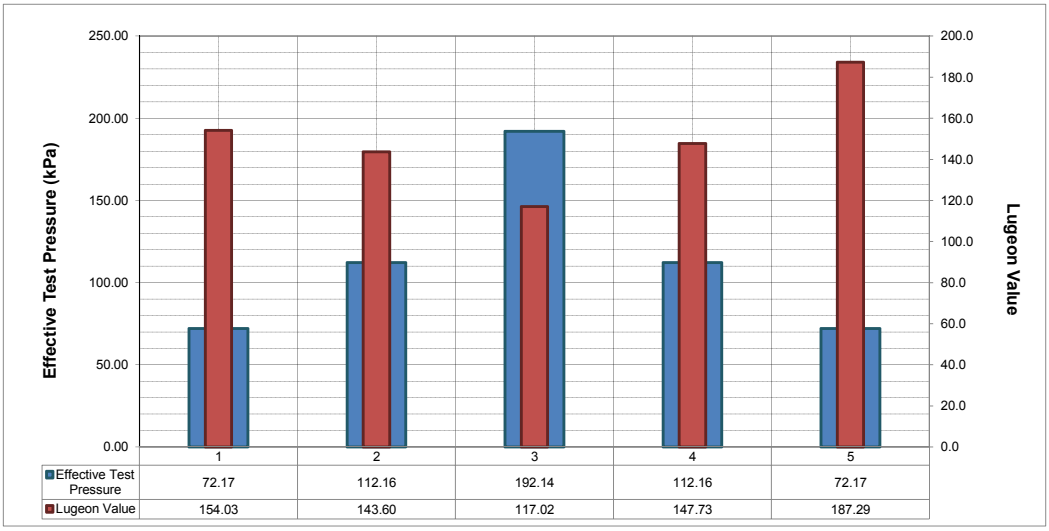
Packer (Lugeon) Test Analysis

Project Name:	*East West Link*	Client	*New Zealand Transport Agency*
Project No:	*4216210*	Borehole ID:	*BH4007*
Date:	*13/05/2016*	Initials:	*ST*
Hole Depth (m):	*9.75*	Hole Dia. (m):	*0.096*
Packer Depth (m):	*5*	Gauge Ht (m):	*0.9*
Test Length (m):	*4.75*	Static head (kPa)[1]	*32.2*
SWL (m bgl):	*2.38*	Contractor:	*McMillan Drilling Group*

Test Step	Length of Step (min)	Water Loss (litres)			Gauge Pressure		Net test pressure (kPa)[2]	Total Head (m)[3]	Water Injected			Lugeon value (Lu)[4]	Permeability (m/s)[5]
		Start	Finish	Total	PSI	kPa			Total Vol (l)	Rate (l/min)	Take (l/min/m)		
1	10	49462.0	49990.0	528	*5.8*	*40*	*72.17*	*7.36*	*528*	*52.80*	*11.12*	*154.03*	*1.8E-05*
2	10	50151.0	50916.0	765	*11.6*	*80*	*112.16*	*11.43*	*765*	*76.50*	*16.11*	*143.60*	*1.7E-05*
3	10	51231.0	52299.0	1068	*23.2*	*160*	*192.14*	*19.59*	*1068*	*106.80*	*22.48*	*117.02*	*1.4E-05*
4	10	52439.0	53226.0	787	*11.6*	*80*	*112.16*	*11.43*	*787*	*78.70*	*16.57*	*147.73*	*1.8E-05*
5	10	53426.0	54068.0	642	*5.8*	*40*	*72.17*	*7.36*	*642*	*64.20*	*13.52*	*187.29*	*2.2E-05*
6													
7													
8													

[1] Static head = (Gauge height + groundwater depth) x 9.81 (m head to kPa conversion)
[2] Net test pressure = gauge pressure + static head - friction losses. Note: frictional head losses considered to be negligible
[3] Total head = Static head + groundwater depth + (net test pressure / 9.81 (kPa to m head conversion))
[4] Lugeon value = (flow rate / length of test section) x (1000kPa reference pressure / net test pressure(kpa))
[5] Permeability = (5.9918e-8) x Lugeon value x LOG10(length of test section/borehole radius) (Richter and Lillich, 1975)





Flow Behaviour Type	**Turbulent**	**Analysis Comment:** Lugeon values decrease as water pressures increase Min. Lugeon value occurs at max. water pressure Representative Lu = average of Stage 2 and 4
Representative Lugeon Value	**145.66**	
Approximate Permeability (m/s)	**1.8E-05**	

NZ TRANSPORT AGENCY WAKA KOTAHI

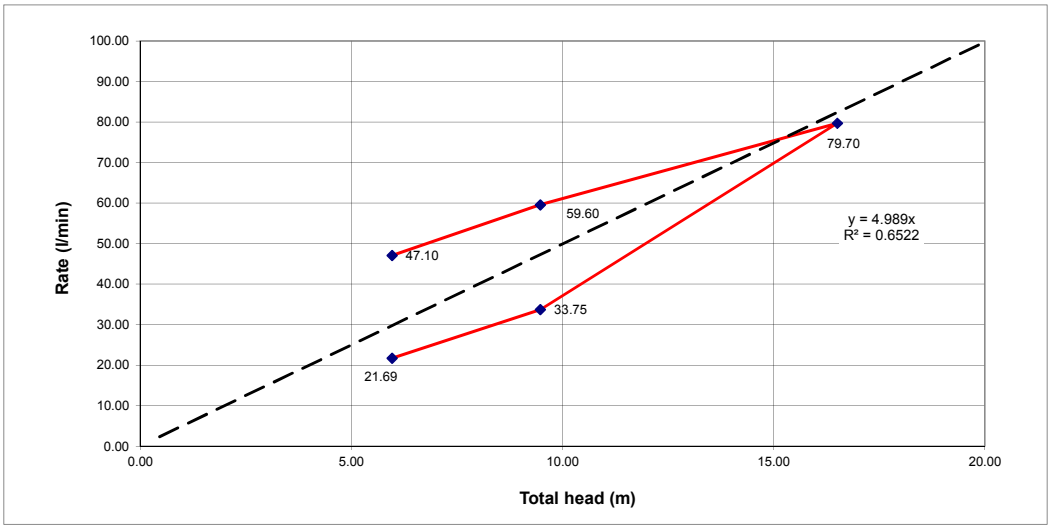
East West Link

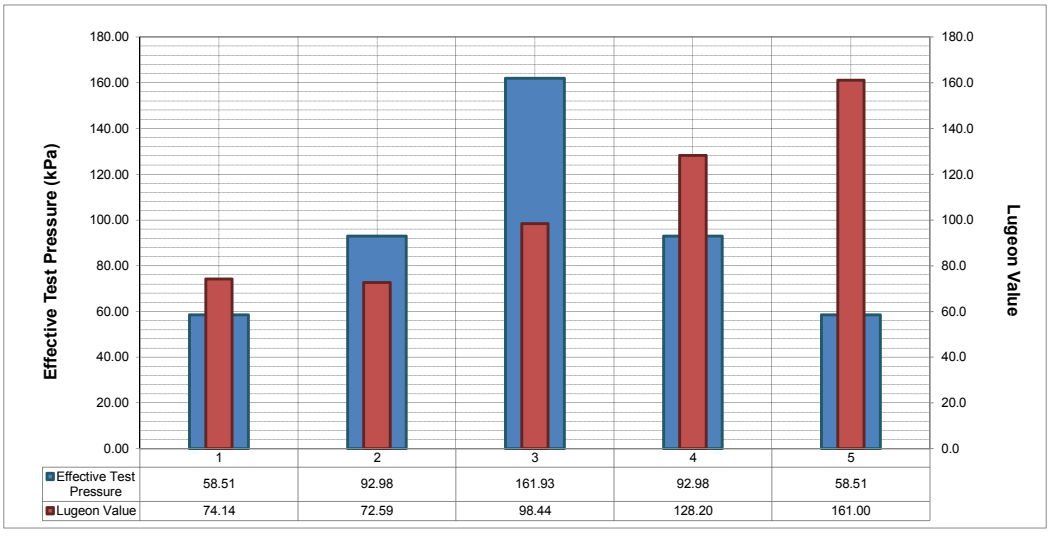
Packer (Lugeon) Test Analysis

Project Name:	*East West Link*	Client	*New Zealand Transport Agency*
Project No:	*4216210*	Borehole ID:	*BH4009*
Date:	*27/04/2016*	Initials:	*JWB*
Hole Depth (m):	*10.5*	Hole Dia. (m):	*0.096*
Packer Depth (m):	*5.5*	Gauge Ht (m):	*0.85*
Test Length (m):	*5*	Static head (kPa)[1]	*24.0*
SWL (m bgl):	*1.6*	Contractor:	*McMillan Drilling Group*

Test Step	Length of Step (min)	Water Loss (litres)			Gauge Pressure		Net test pressure (kPa)[2]	Total Head (m)[3]	Water Injected			Lugeon value (Lu)[4]	Permeability (m/s)[5]
		Start	Finish	Total	PSI	kPa			Total Vol (l)	Rate (l/min)	Take (l/min/m)		
1	10	35891.3	36108.2	216.9	*5*	*34*	*58.51*	*5.96*	*216.9*	*21.69*	*4.34*	*74.14*	*9.0E-06*
2	10	36280.2	36617.7	337.5	*10*	*69*	*92.98*	*9.48*	*337.5*	*33.75*	*6.75*	*72.59*	*8.8E-06*
3	10	36940.0	37737.0	797	*20*	*138*	*161.93*	*16.51*	*797*	*79.70*	*15.94*	*98.44*	*1.2E-05*
4	10	37851.0	38447.0	596	*10*	*69*	*92.98*	*9.48*	*596*	*59.60*	*11.92*	*128.20*	*1.5E-05*
5	10	38516.0	38987.0	471	*5*	*34*	*58.51*	*5.96*	*471*	*47.10*	*9.42*	*161.00*	*1.9E-05*
6													
7													
8													

[1] Static head = (Gauge height + groundwater depth) x 9.81 (m head to kPa conversion)
[2] Net test pressure = gauge pressure + static head - friction losses. Note: frictional head losses considered to be negligible
[3] Total head = Static head + groundwater depth + (net test pressure / 9.81 (kPa to m head conversion))
[4] Lugeon value = (flow rate / length of test section) x (1000kPa reference pressure / net test pressure(kpa))
[5] Permeability = (5.9918e-8) x Lugeon value x LOG10(length of test section/borehole radius) (Richter and Lillich, 1975)





Flow Behaviour Type	**Washout**	**Analysis Comment:** Lugeon values increase as test proceeds
Representative Lugeon Value	**161.00**	Representative Lugeon value = maximum (Stage 5)
Approximate Permeability (m/s)	**1.3E-05**	

NZ TRANSPORT AGENCY WAKA KOTAHI

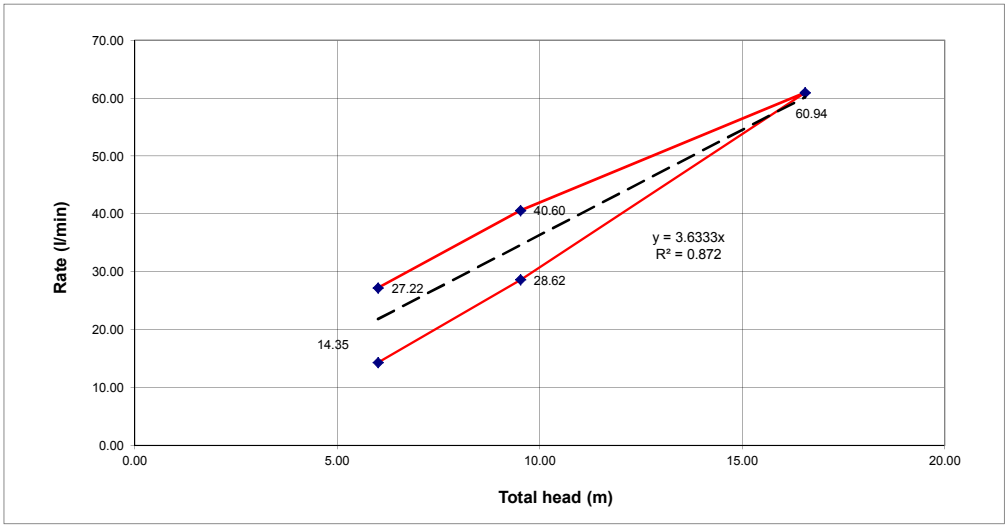
East West Link

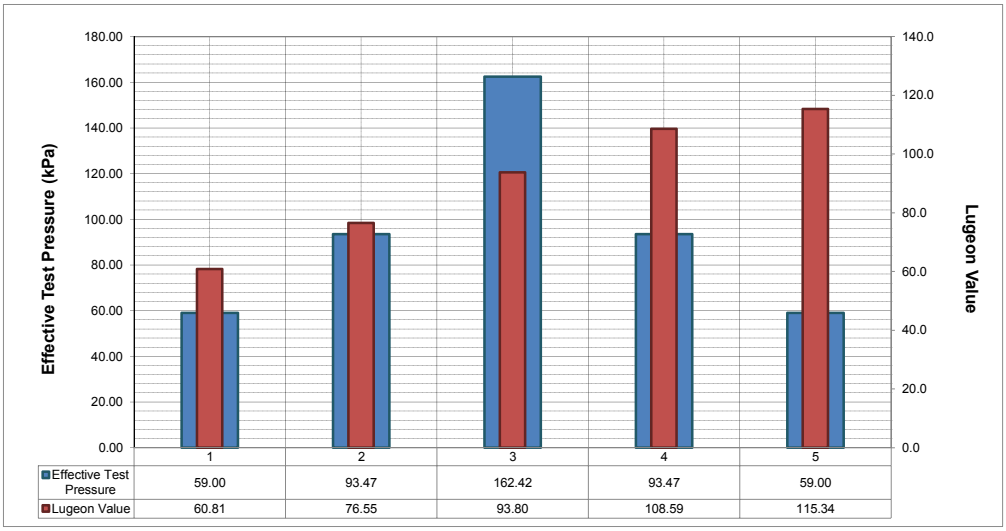
Packer (Lugeon) Test Analysis

Project Name:	*East West Link*	Client	*New Zealand Transport Agency*
Project No:	*4216210*	Borehole ID:	*BH4010*
Date:	*18/04/2016*	Initials:	*JWB*
Hole Depth (m):	*10.5*	Hole Dia. (m):	*0.096*
Packer Depth (m):	*6.5*	Gauge Ht (m):	*0.84*
Test Length (m):	*4*	Static head (kPa)[1]	*24.5*
SWL (m bgl):	*1.66*	Contractor:	*McMillan Drilling Group*

Test Step	Length of Step (min)	Water Loss (litres)			Gauge Pressure		Net test pressure (kPa)[2]	Total Head (m)[3]	Water Injected			Lugeon value (Lu)[4]	Permeability (m/s)[5]
		Start	Finish	Total	PSI	kPa			Total Vol (l)	Rate (l/min)	Take (l/min/m)		
1	10	29079.5	29223.0	143.5	*5*	*34*	*59.00*	*6.01*	*143.5*	*14.35*	*3.59*	*60.81*	*7.0E-06*
2	10	29274.7	29560.9	286.2	*10*	*69*	*93.47*	*9.53*	*286.2*	*28.62*	*7.16*	*76.55*	*8.8E-06*
3	10	29622.3	30231.7	609.4	*20*	*138*	*162.42*	*16.56*	*609.4*	*60.94*	*15.24*	*93.80*	*1.1E-05*
4	10	30285.2	30691.2	406	*10*	*69*	*93.47*	*9.53*	*406*	*40.60*	*10.15*	*108.59*	*1.2E-05*
5	10	30711.5	30983.7	272.2	*5*	*34*	*59.00*	*6.01*	*272.2*	*27.22*	*6.81*	*115.34*	*1.3E-05*
6													
7													
8													

[1] Static head = (Gauge height + groundwater depth) x 9.81 (m head to kPa conversion)
[2] Net test pressure = gauge pressure + static head - friction losses. Note: frictional head losses considered to be negligible
[3] Total head = Static head + groundwater depth + (net test pressure / 9.81 (kPa to m head conversion))
[4] Lugeon value = (flow rate / length of test section) x (1000kPa reference pressure / net test pressure(kpa))
[5] Permeability = (5.9918e-8) x Lugeon value x LOG10(length of test section/borehole radius) (Richter and Lillich, 1975)





Flow Behaviour Type	**Washout**	**Analysis Comment:** Lugeon values increase as test proceeds
Representative Lugeon Value	**115.34**	Representative Lugeon value = maximum (Stage 5)
Approximate Permeability (m/s)	**1.0E-05**	

NZ TRANSPORT AGENCY WAKA KOTAHI

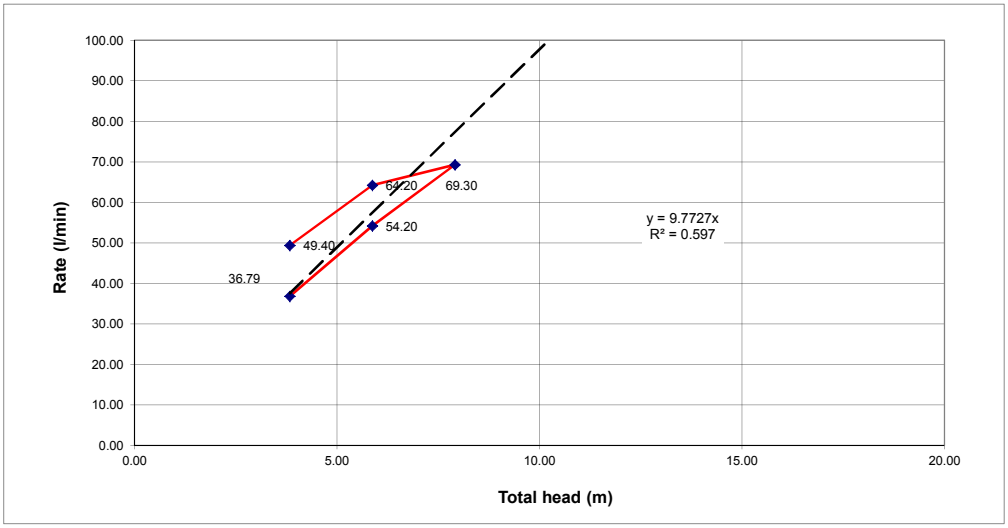
East West Link

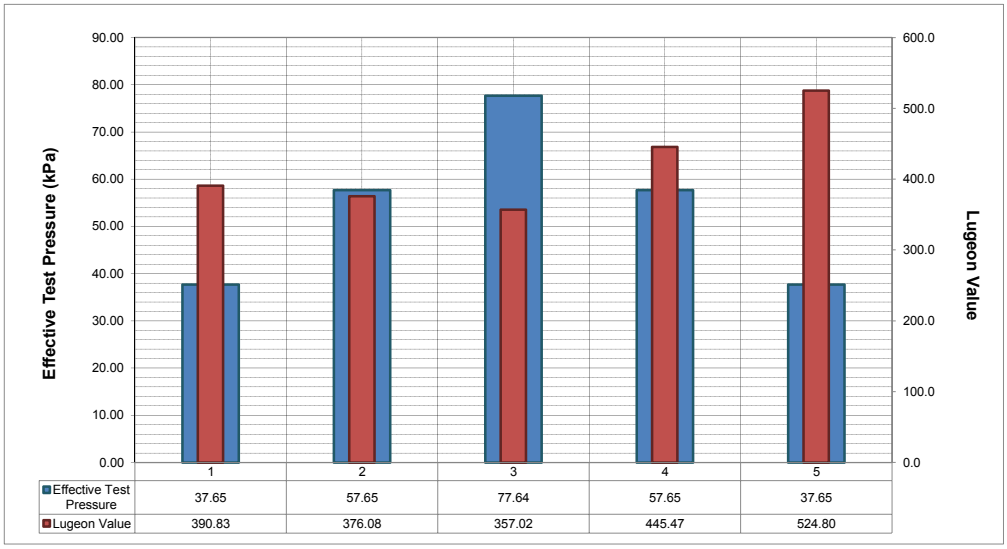
Packer (Lugeon) Test Analysis

Project Name:	*East West Link*	Client	*New Zealand Transport Agency*
Project No:	*4216210*	Borehole ID:	*BH4011*
Date:	*9/05/2016*	Initials:	*JM*
Hole Depth (m):	*5*	Hole Dia. (m):	*0.096*
Packer Depth (m):	*2.5*	Gauge Ht (m):	*0.95*
Test Length (m):	*2.5*	Static head (kPa)[1]	*17.7*
SWL (m bgl):	*0.85*	Contractor:	*McMillan Drilling Group*

Test Step	Length of Step (min)	Water Loss (litres)			Gauge Pressure		Net test pressure (kPa)[2]	Total Head (m)[3]	Water Injected			Lugeon value (Lu)[4]	Permeability (m/s)[5]
		Start	Finish	Total	PSI	kPa			Total Vol (l)	Rate (l/min)	Take (l/min/m)		
1	10	46173.9	46541.8	367.9	*2.9*	*20*	*37.65*	*3.84*	*367.9*	*36.79*	*14.72*	*390.83*	*4.0E-05*
2	10	46627	47169	542	*5.8*	*40*	*57.65*	*5.88*	*542*	*54.20*	*21.68*	*376.08*	*3.9E-05*
3	10	47263	47956	693	*8.7*	*60*	*77.64*	*7.91*	*693*	*69.30*	*27.72*	*357.02*	*3.7E-05*
4	10	48066	48708	642	*5.8*	*40*	*57.65*	*5.88*	*642*	*64.20*	*25.68*	*445.47*	*4.6E-05*
5	10	48759	49253	494	*2.9*	*20*	*37.65*	*3.84*	*494*	*49.40*	*19.76*	*524.80*	*5.4E-05*
6													
7													
8													

[1] Static head = (Gauge height + groundwater depth) x 9.81 (m head to kPa conversion)
[2] Net test pressure = gauge pressure + static head - friction losses. Note: frictional head losses considered to be negligible
[3] Total head = Static head + groundwater depth + (net test pressure / 9.81 (kPa to m head conversion))
[4] Lugeon value = (flow rate / length of test section) x (1000kPa reference pressure / net test pressure(kpa))
[5] Permeability = (5.9918e-8) x Lugeon value x LOG10(length of test section/borehole radius) (Richter and Lillich, 1975)





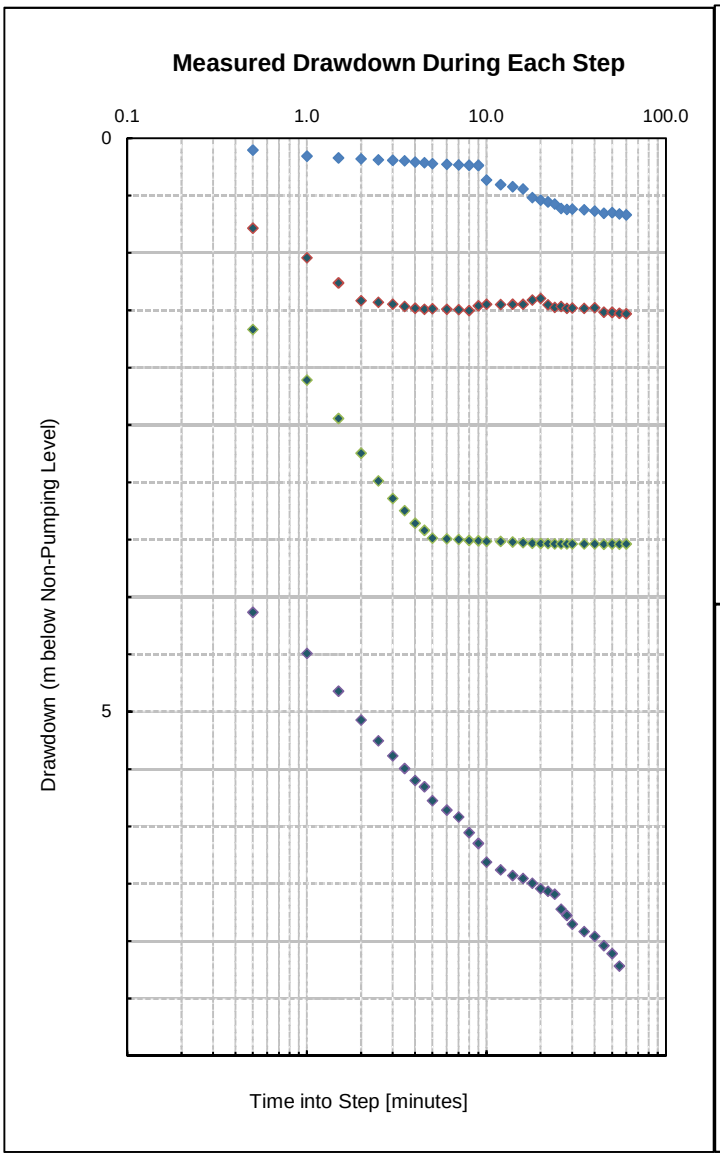
Flow Behaviour Type	**Washout**	**Analysis Comment:** Lugeon values increase as test proceeds
Representative Lugeon Value	**524.80**	Representative Lugeon value = maximum (Stage 5)
Approximate Permeability (m/s)	**4.3E-05**	

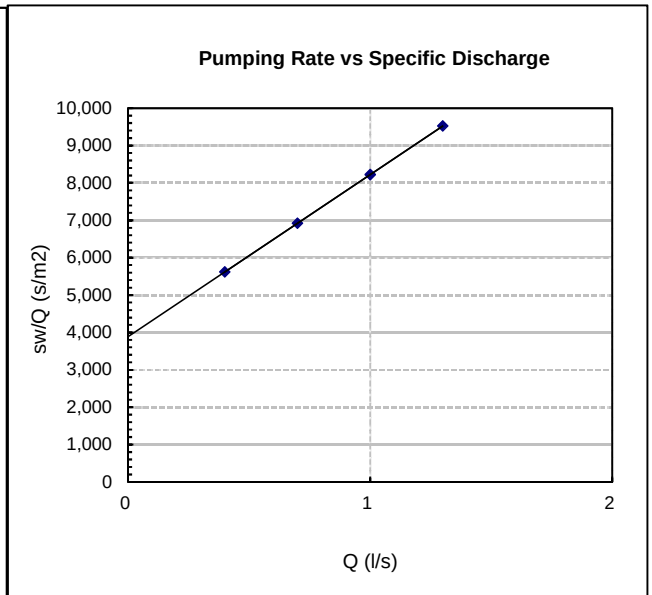
Appendix A5

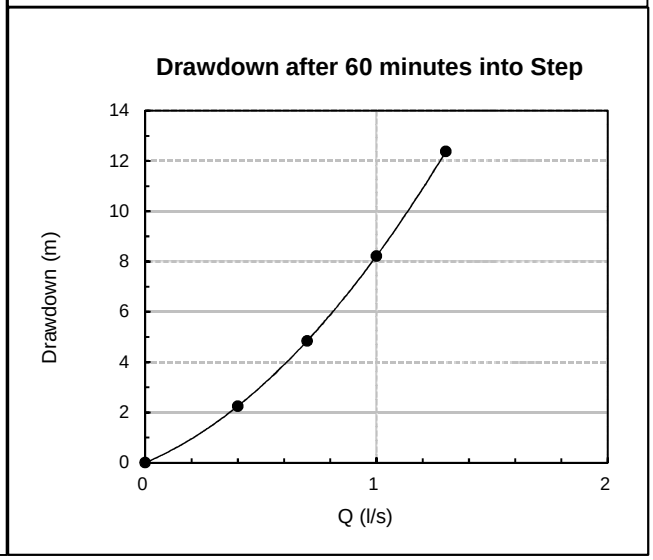
Pumping Test Analysis and Results

BH5005P

Step-Rate Pumping Test
Test Date: 1/07/2016







Non-Pumping ("Static") Water Level: 0.58 m bgl

$sw(t)_{total} = B(t)Q + CQ^2$ where:

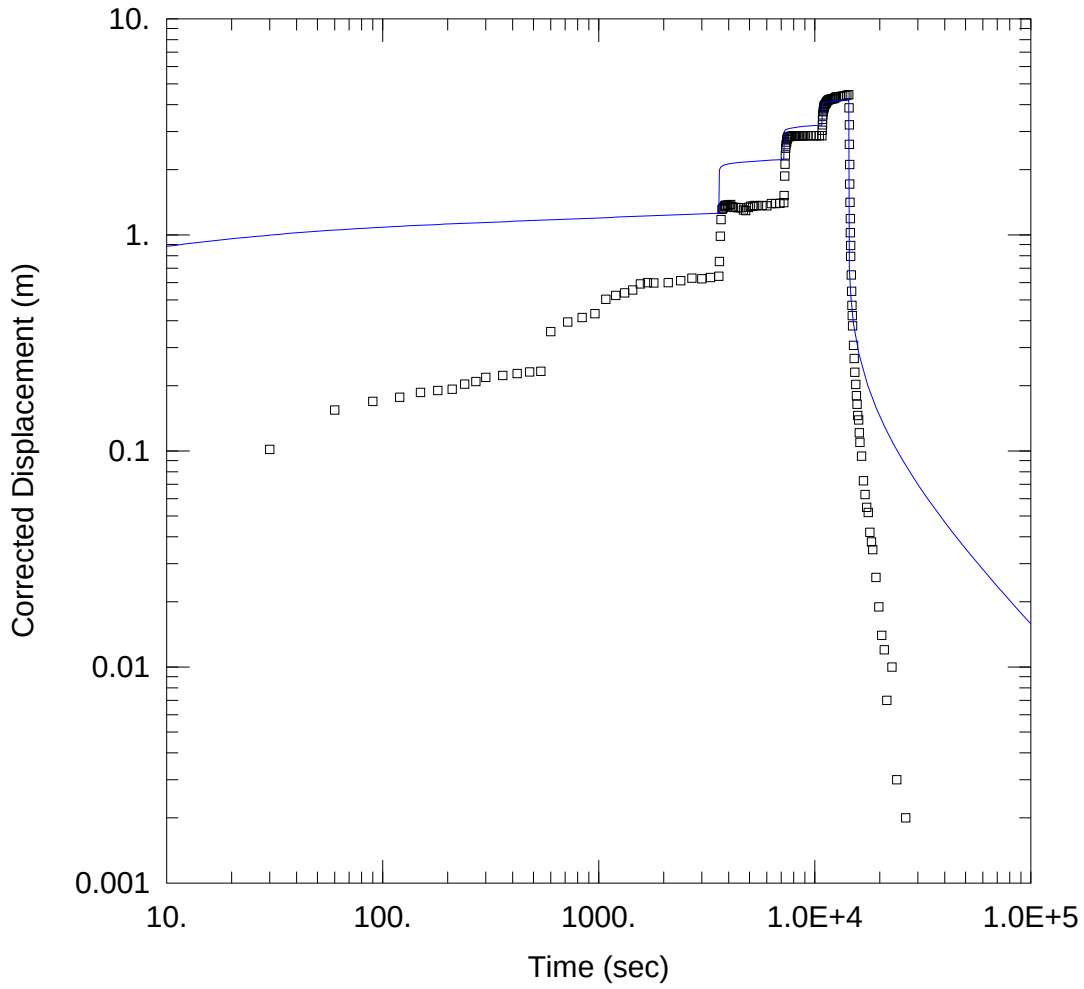
$sw(t)_{total}$ = Total drawdown in well 7.216 m

Q = Pumping rate 1.3 l/s

B(t) = Formation loss factor = B(t) = 3885 s/m^2 = 64.76 min/m^2

C = Well loss factor = C = 4335722 s^2/m^5 = 1204.367 min^2/m^5 Efficiency = $BQ/(BQ+CQ^2)$

Measured Values at 60 min into Step						Calculated Values at 60 min into Step					
Step	Q l/s	sw_{total} m	sw_{step} m	Q/sw_{total} l/s /m	sw/Q s/m^2	BQ ("Formation Loss") m	CQ^2 ("Well Loss") m	sw_{total} ("Combined Loss") m	Q/sw_{total} l/s /m	sw/Q s/m^2	Efficiency %
0	0	0	0	0	0	0	0	0	0	0	NA
1	0.40	0.67	0.67	0.60	1,665	1.55	0.69	2.25	0.18	5,620	69%
2	0.70	1.53	0.87	0.46	2,187	2.72	2.12	4.84	0.14	6,920	56%
3	1.00	3.54	2.01	0.28	3,537	3.89	4.34	8.22	0.12	8,221	47%
4	1.30	7.22	3.68	0.18	5,551	5.05	7.33	12.38	0.11	9,522	41%



WELL TEST ANALYSIS

Data Set: P:\...\BH5005P_Step_test_Unconfined_Theis.aqt
Date: 07/22/16 Time: 13:40:55

PROJECT INFORMATION

Company: Beca
Client: NZTA
Project: 4216210
Location: EWL
Test Well: BH5005P
Test Date: 1/07/16

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
BH5005P	0	0

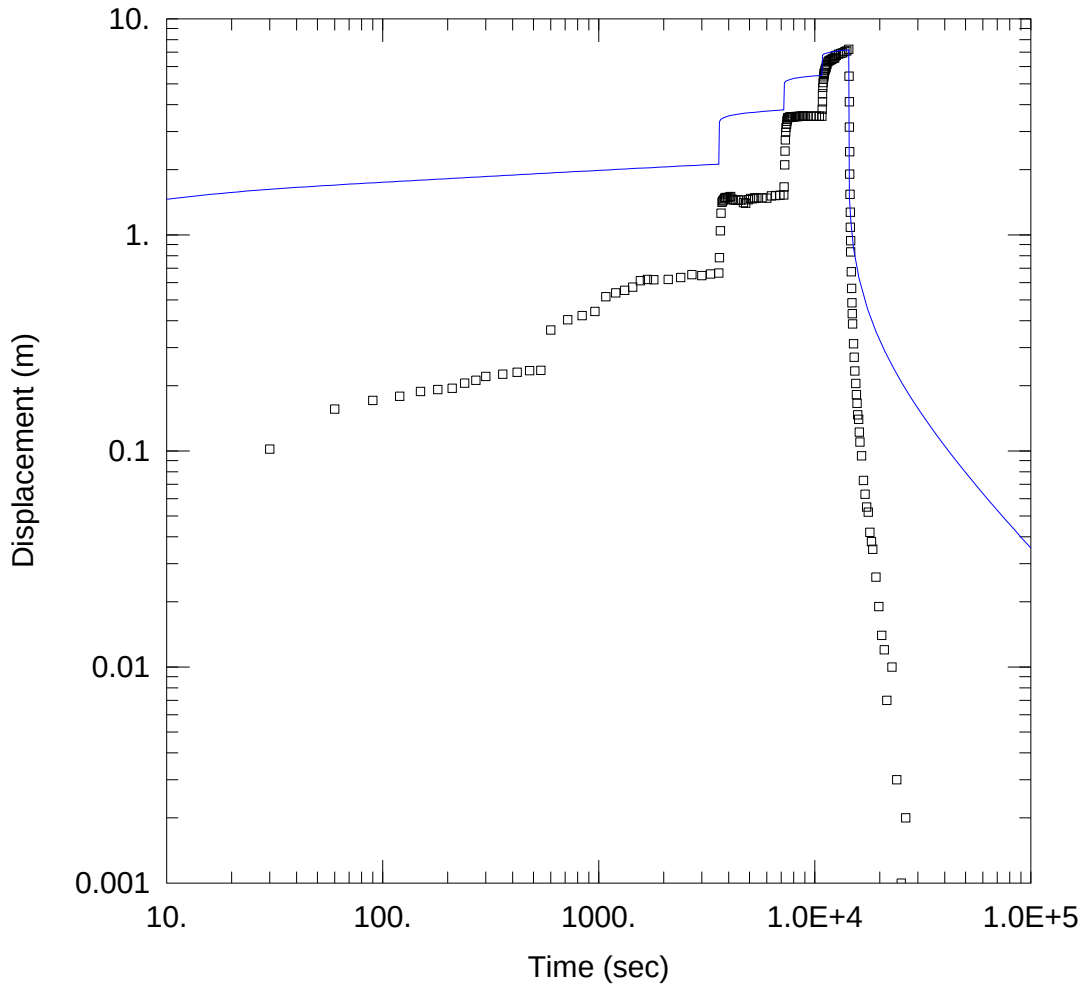
Observation Wells

Well Name	X (m)	Y (m)
BH5005P	0	0

SOLUTION

Aquifer Model: Unconfined
Solution Method: Theis

T = 58.5 m^2/day
S = 0.004308
Kz/Kr = 1.
b = 9.416 m



WELL TEST ANALYSIS

Data Set: P:\...\BH5005P_Step_test_Unconfined_Moench.aqt
Date: 07/22/16 Time: 13:46:48

PROJECT INFORMATION

Company: Beca
Client: NZTA
Project: 4216210
Location: EWL
Test Well: BH5005P
Test Date: 1/07/16

AQUIFER DATA

Saturated Thickness: 9.416 m Anisotropy Ratio (Kz/Kr): 14.67

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
BH5005P	0	0

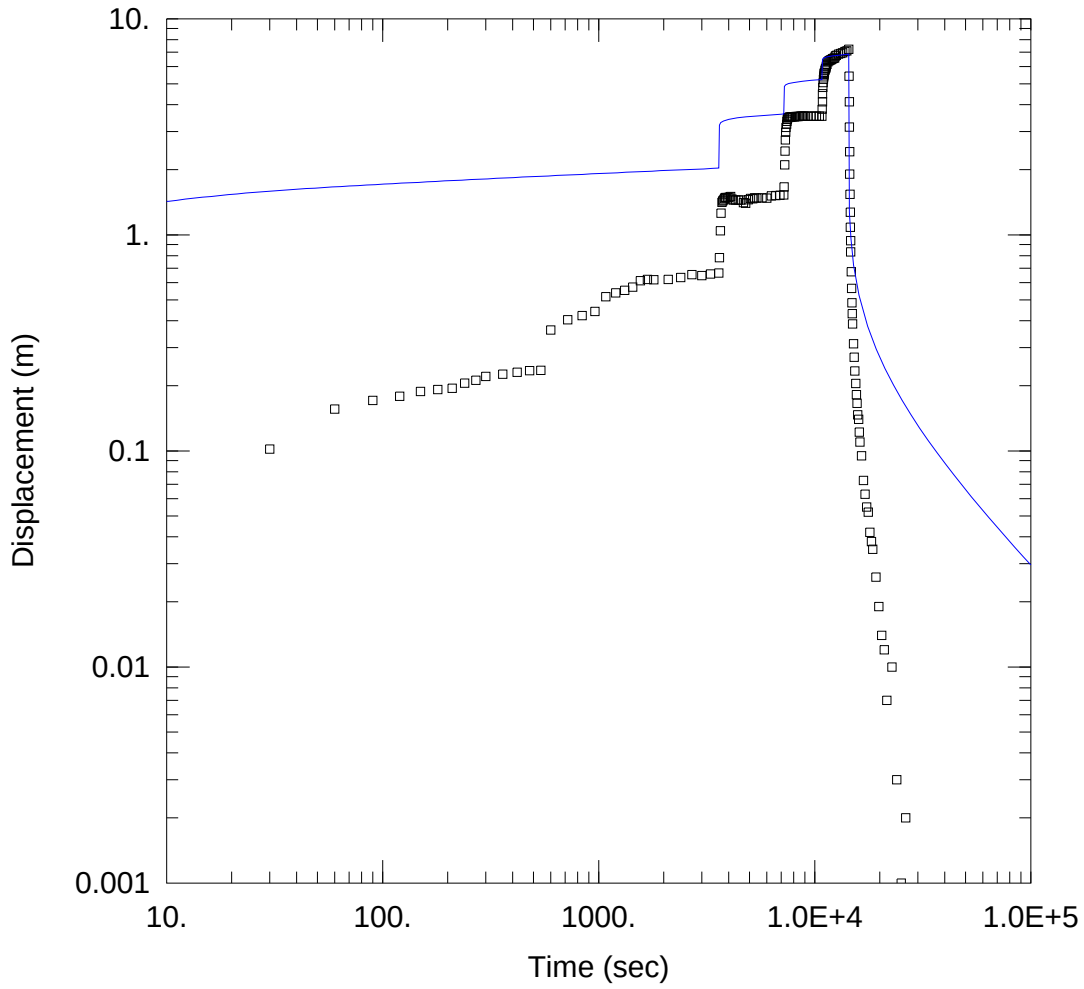
Observation Wells

Well Name	X (m)	Y (m)
BH5005P	0	0

SOLUTION

Aquifer Model: Unconfined
Solution Method: Moench

T = 26.01 m^2/day
S = 0.007114
Sy = 0.001
Kz/Kr = 14.67



WELL TEST ANALYSIS

Data Set: P:\...\BH5005P_Step_test_Unconfined_Tartakovsky-Neuman.aqt
Date: 07/22/16 Time: 13:47:59

PROJECT INFORMATION

Company: Beca
Client: NZTA
Project: 4216210
Location: EWL
Test Well: BH5005P
Test Date: 1/07/16

AQUIFER DATA

Saturated Thickness: 9.416 m Anisotropy Ratio (Kz/Kr): 14.67

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
BH5005P	0	0

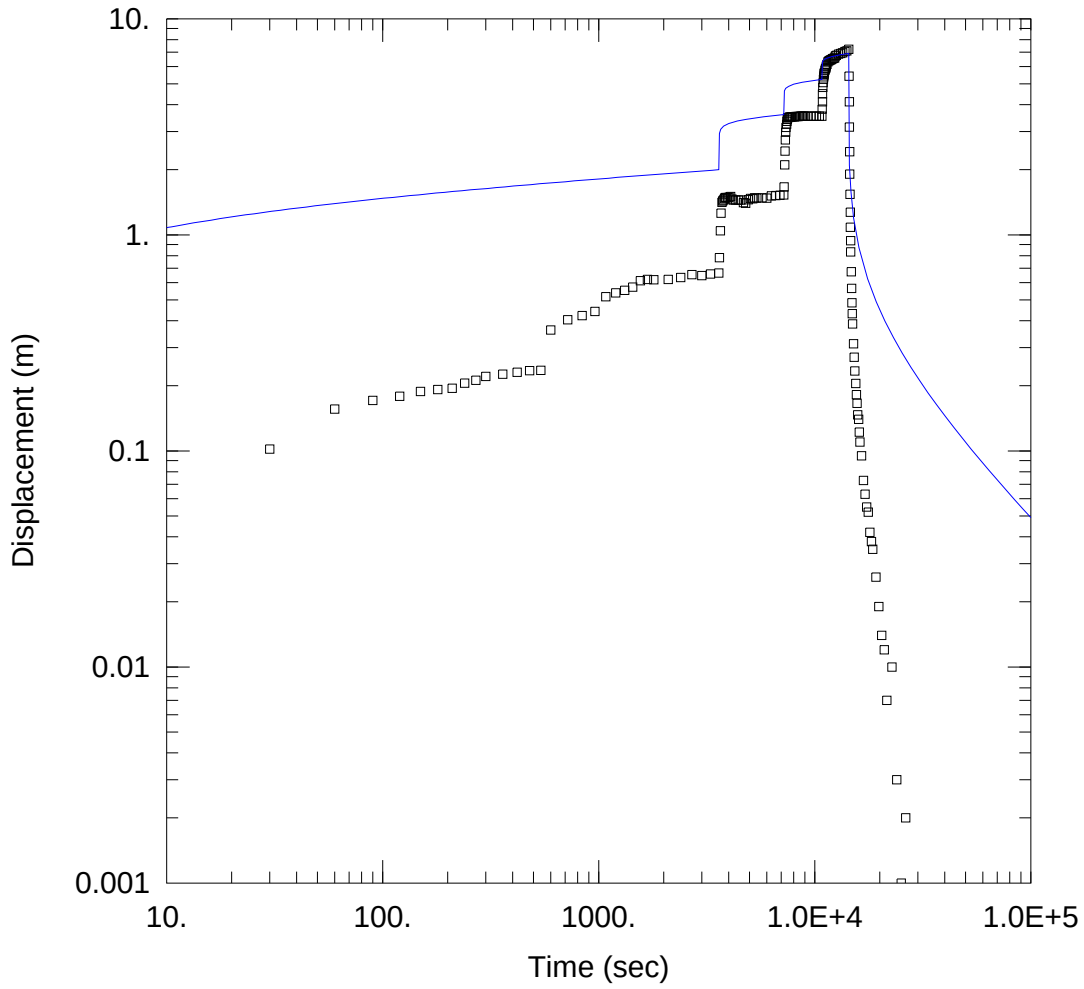
Observation Wells

Well Name	X (m)	Y (m)
BH5005P	0	0

SOLUTION

Aquifer Model: Unconfined
Solution Method: Tartakovsky-Neuman

T = 26.01 m^2/day
S = 0.007114
Sy = 0.001
Kz/Kr = 14.67



WELL TEST ANALYSIS

Data Set: P:\...\BH5005P_Step_test_Leaky_Hantush-Jacob.aqt
Date: 07/22/16 Time: 13:36:55

PROJECT INFORMATION

Company: Beca
Client: NZTA
Project: 4216210
Location: EWL
Test Well: BH5005P
Test Date: 1/07/16

AQUIFER DATA

Saturated Thickness: 5. m
Aquitard Thickness (b'): 4.5 m
Anisotropy Ratio (Kz/Kr): 1.
Aquitard Thickness (b"): 1. m

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
BH5005P	0	0

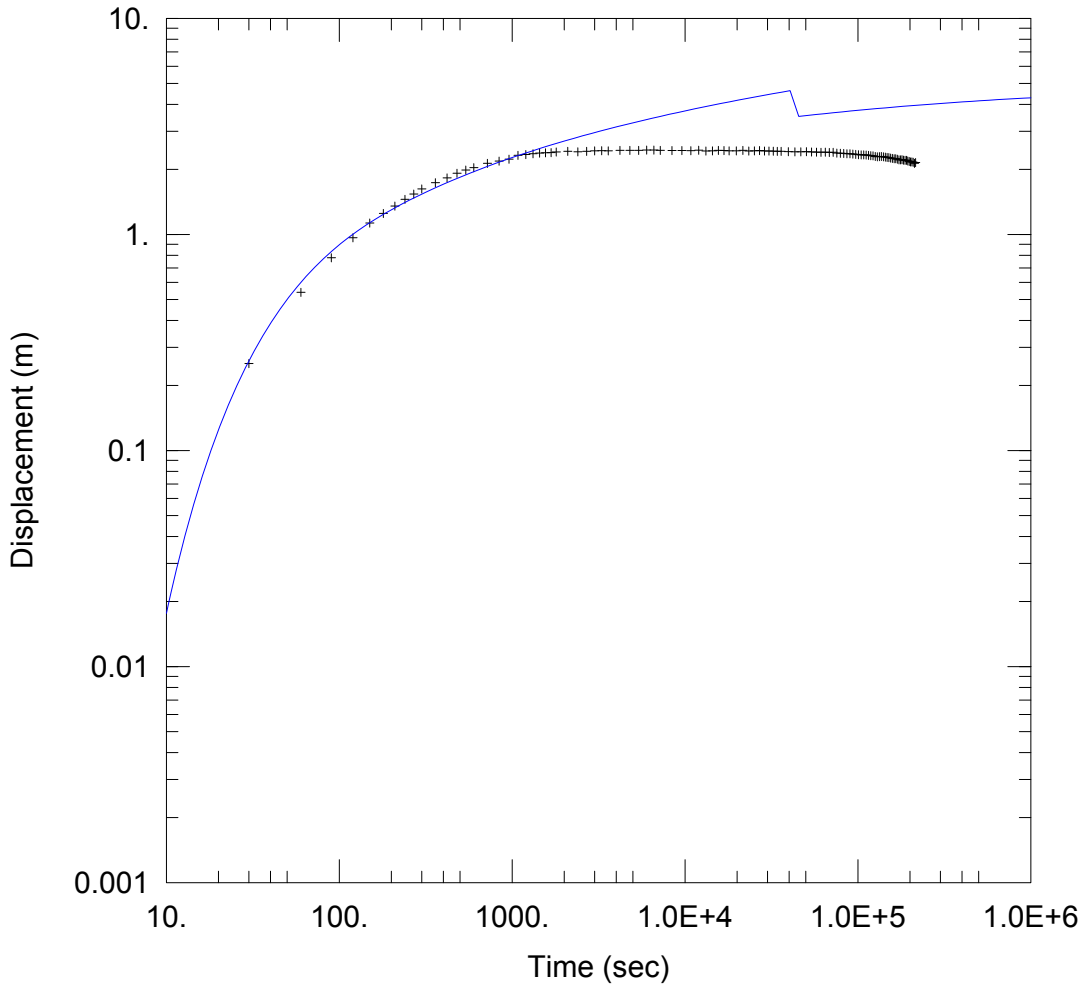
Observation Wells

Well Name	X (m)	Y (m)
BH5005P	0	0

SOLUTION

Aquifer Model: Leaky
Solution Method: Hantush-Jacob

T = 18.84 m^2/day
S = 0.006995



WELL TEST ANALYSIS

Data Set: P:\...\BH5005P_CRT_unconfined_Theis.aqt
Date: 07/14/16 Time: 16:08:23

PROJECT INFORMATION

Company: Beca
Client: NZTA
Project: 4216210
Location: EWL
Test Well: BH5005P
Test Date: 1/07/16

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
BH5005P	0	0

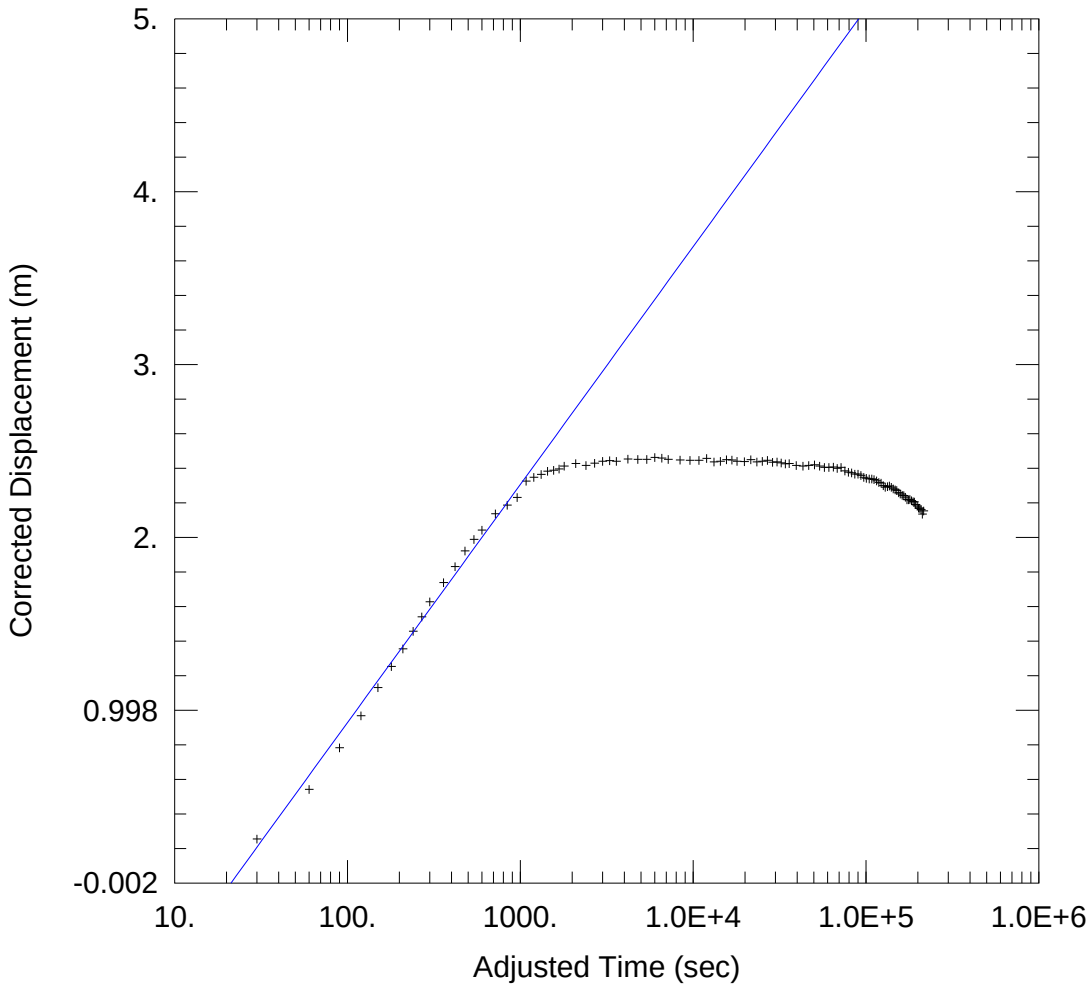
Observation Wells

Well Name	X (m)	Y (m)
+ BH5005	4	0

SOLUTION

Aquifer Model: Unconfined
Solution Method: Theis

T = 13.92 m^2/day
S = 0.001189
Kz/Kr = 1.
b = 9.327 m



WELL TEST ANALYSIS

Data Set: P:\...\BH5005P_CRT_unconfined_Cooper-Jacob.aqt
Date: 08/26/16 Time: 12:07:03

PROJECT INFORMATION

Company: Beca
Client: NZTA
Project: 4216210
Location: EWL
Test Well: BH5005P
Test Date: 1/07/16

AQUIFER DATA

Saturated Thickness: 9.327 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
BH5005P	0	0

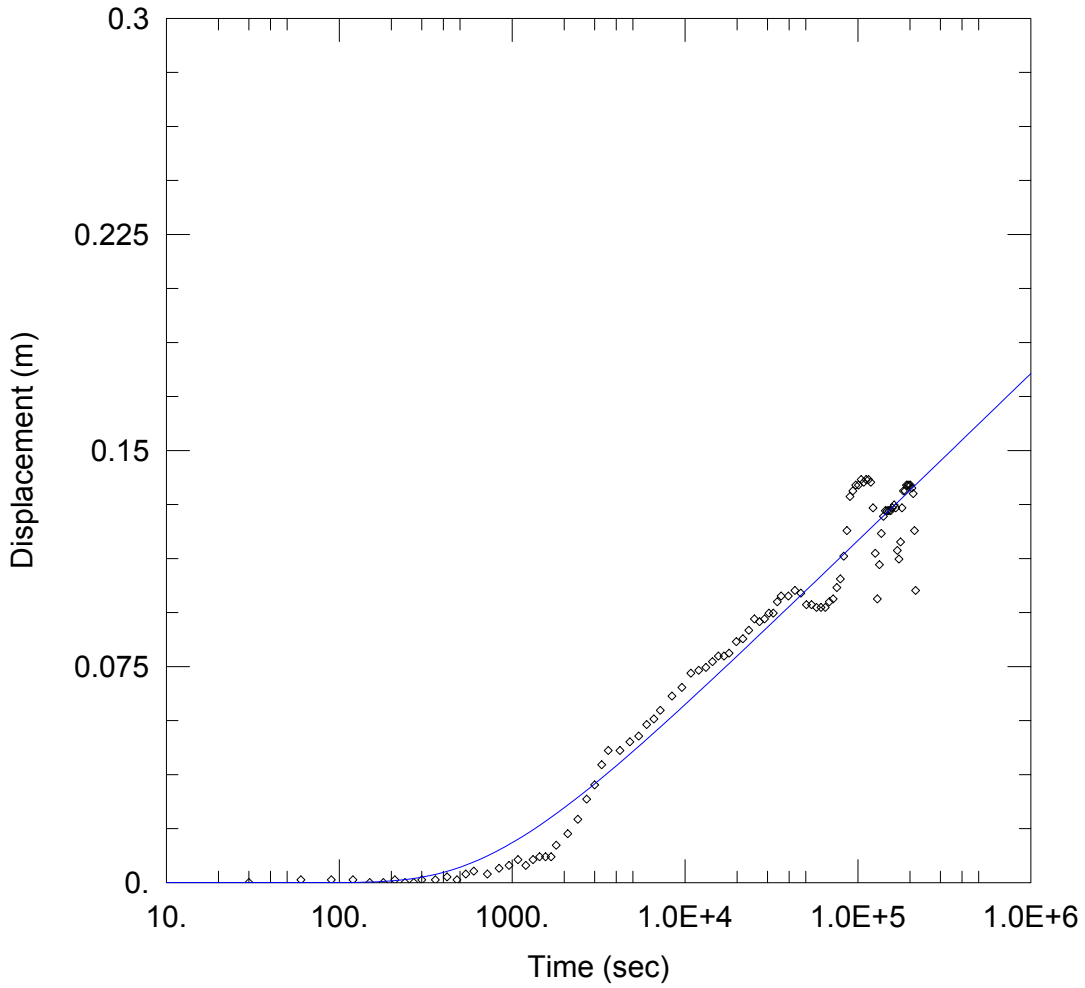
Observation Wells

Well Name	X (m)	Y (m)
+ BH5005	4	0

SOLUTION

Aquifer Model: Unconfined Solution Method: Cooper-Jacob

T = 14.94 m^2/day S = 0.0005162



WELL TEST ANALYSIS

Data Set: P:\...\BH5005P_CRT_unconfined_Theis.aqt
Date: 08/03/16 Time: 12:22:58

PROJECT INFORMATION

Company: Beca
Client: NZTA
Project: 4216210
Location: EWL
Test Well: BH5005P
Test Date: 1/07/16

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
BH5005P	0	0

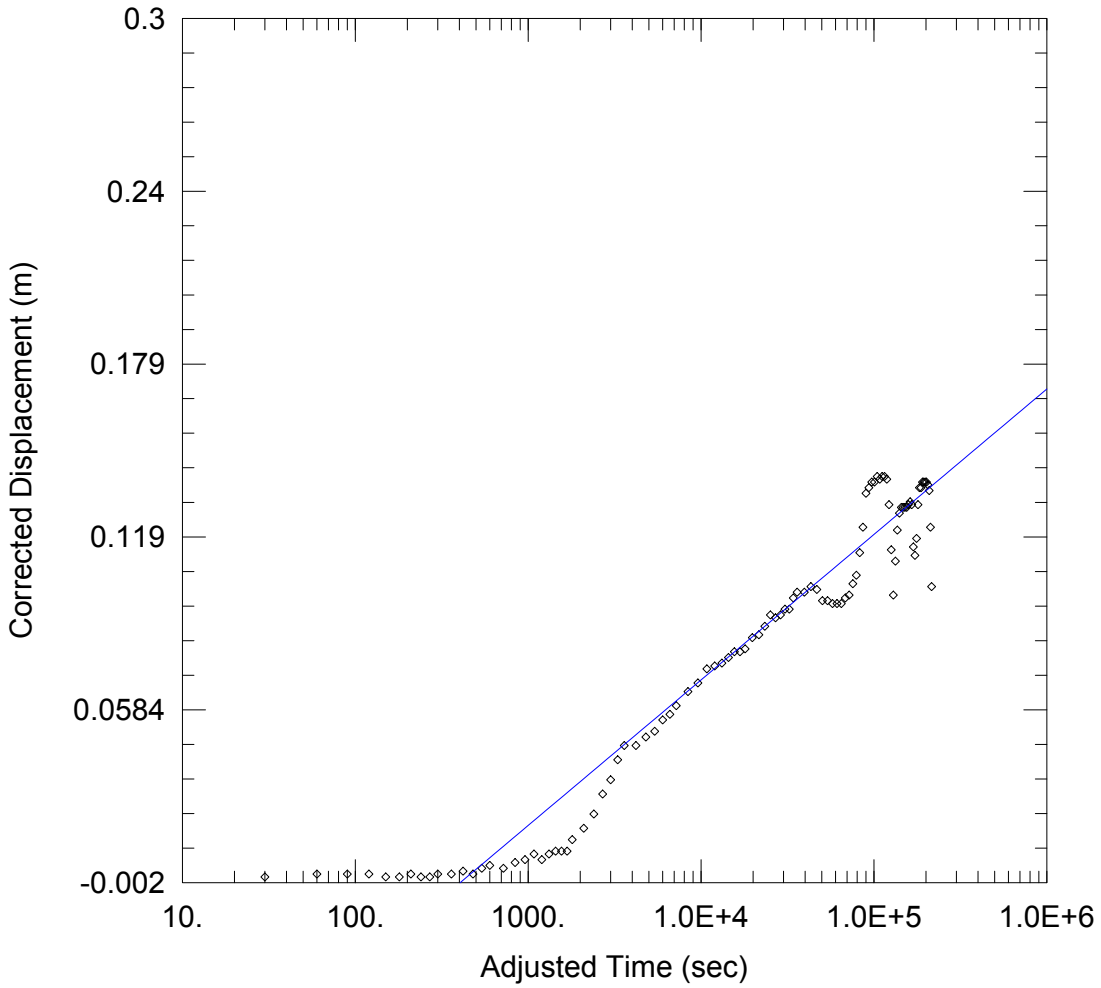
Observation Wells

Well Name	X (m)	Y (m)
◇ BH5006	84.4	0

SOLUTION

Aquifer Model: Unconfined
Solution Method: Theis

T = 354.4 m^2/day
S = 0.001173
Kz/Kr = 1.
b = 9.327 m



WELL TEST ANALYSIS

Data Set: C:\...\BH5005P_CRT_unconfined_Cooper-Jacob.aqt
Date: 08/03/16 Time: 13:47:42

PROJECT INFORMATION

Company: Beca
Client: NZTA
Project: 4216210
Location: EWL
Test Well: BH5005P
Test Date: 1/07/16

AQUIFER DATA

Saturated Thickness: 9.327 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

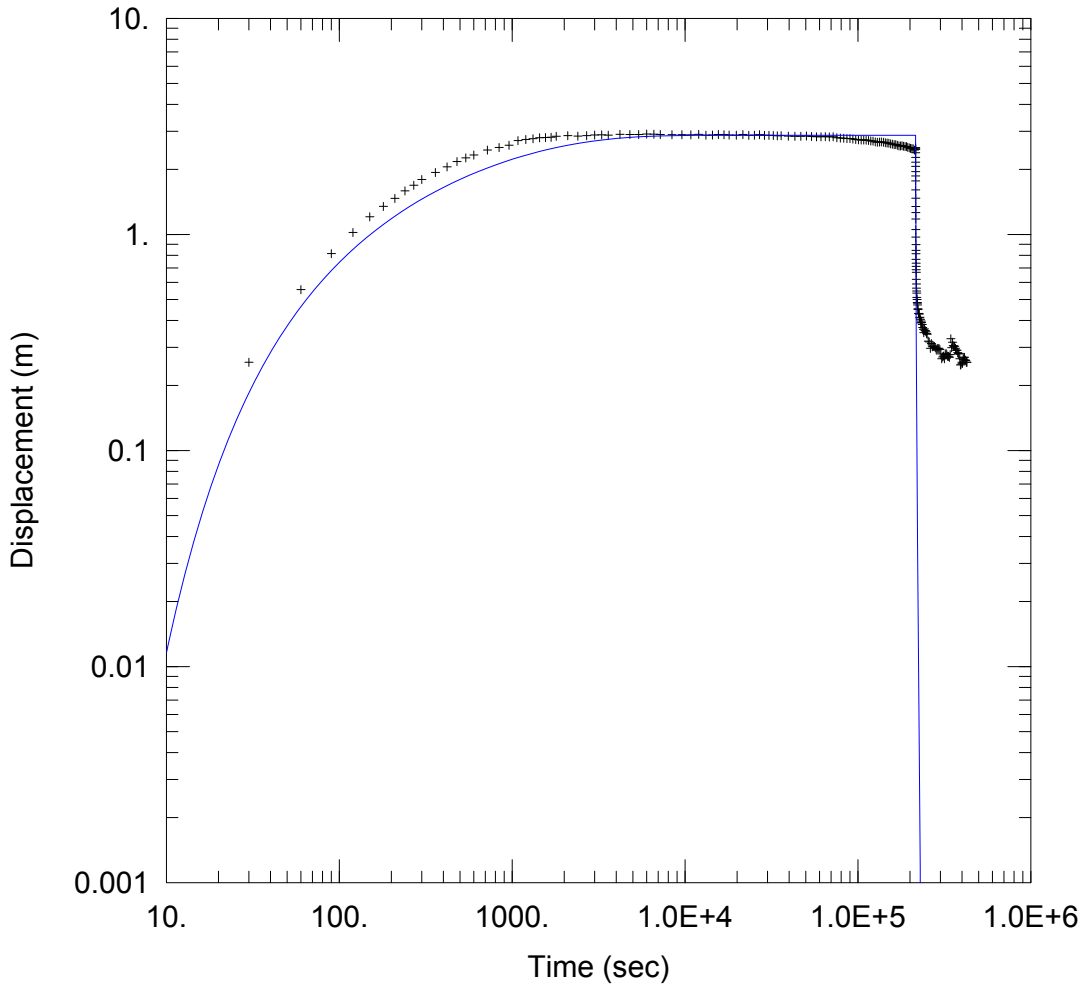
Well Name	X (m)	Y (m)
BH5005P	0	0

Observation Wells

Well Name	X (m)	Y (m)
◇ BH5006	84.4	0

SOLUTION

Aquifer Model: Unconfined Solution Method: Cooper-Jacob
T = 404.8 m^2/day S = 0.0006547



WELL TEST ANALYSIS

Data Set: C:\...\BH5005P_CRT_leaky_.aqt
Date: 08/03/16 Time: 16:19:26

PROJECT INFORMATION

Company: Beca
Client: NZTA
Project: 4216210
Location: EWL
Test Well: BH5005P
Test Date: 1/07/16

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
BH5005P	0	0

Observation Wells

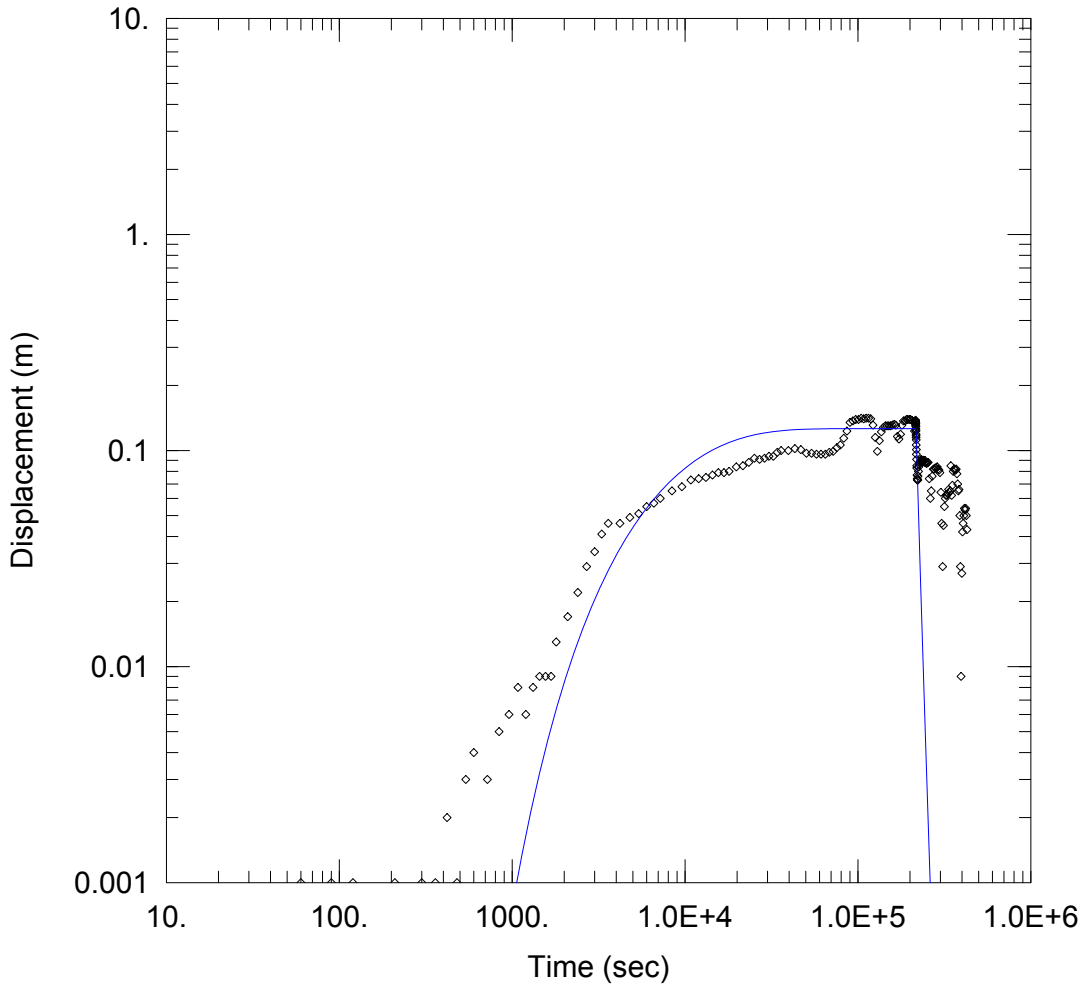
Well Name	X (m)	Y (m)
+ BH5005	6	0

SOLUTION

Aquifer Model: Leaky
Solution Method: Hantush-Jacob

T = 10.76 m^2/day
1/B = 0.03418 m^{-1}
b = 5.4 m

S = 0.0004168
Kz/Kr = 1.



WELL TEST ANALYSIS

Data Set: C:\...\BH5005P_CRT_leaky_.aqt
Date: 08/03/16 Time: 16:27:49

PROJECT INFORMATION

Company: Beca
Client: NZTA
Project: 4216210
Location: EWL
Test Well: BH5005P
Test Date: 1/07/16

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
BH5005P	0	0

Observation Wells

Well Name	X (m)	Y (m)
◇ BH5006	81	0

SOLUTION

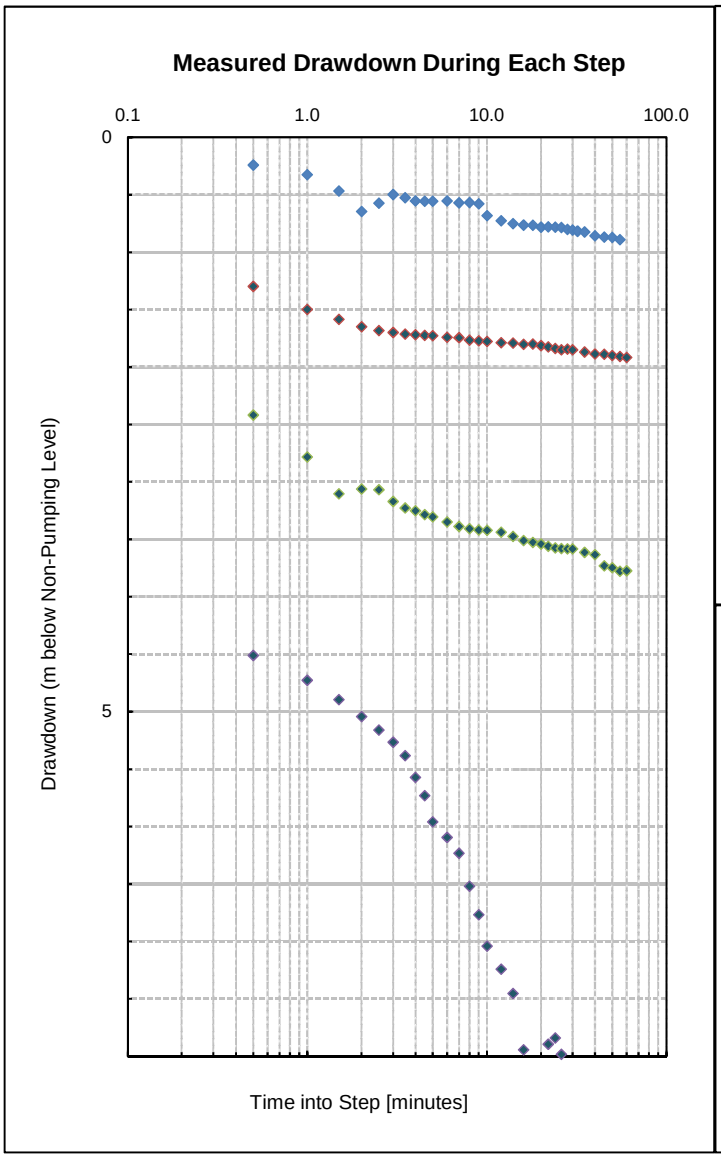
Aquifer Model: Leaky
Solution Method: Hantush-Jacob

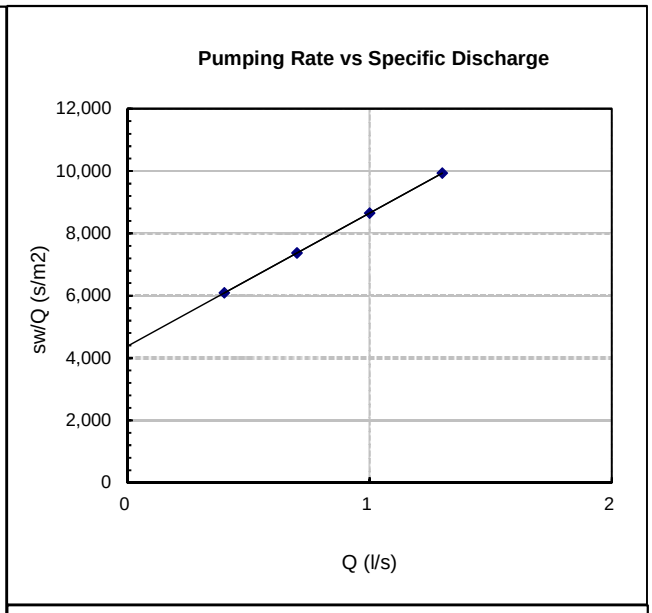
T = 53.24 m^2/day
1/B = 0.01333 m^{-1}
b = 5.4 m

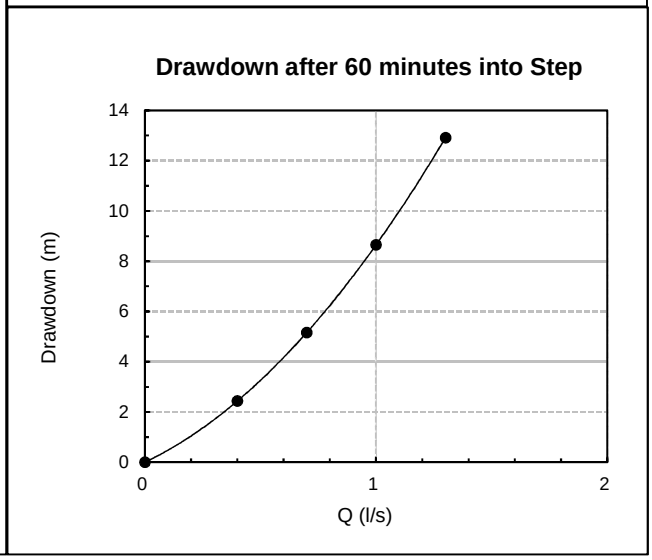
S = 0.001426
Kz/Kr = 1.

BH5008P

Step-Rate Pumping Test
Test Date: 12/07/2016







Non-Pumping ("Static") Water Level: 3.07 m bgl

$sw(t)_{total} = B(t)Q + CQ^2$ where:

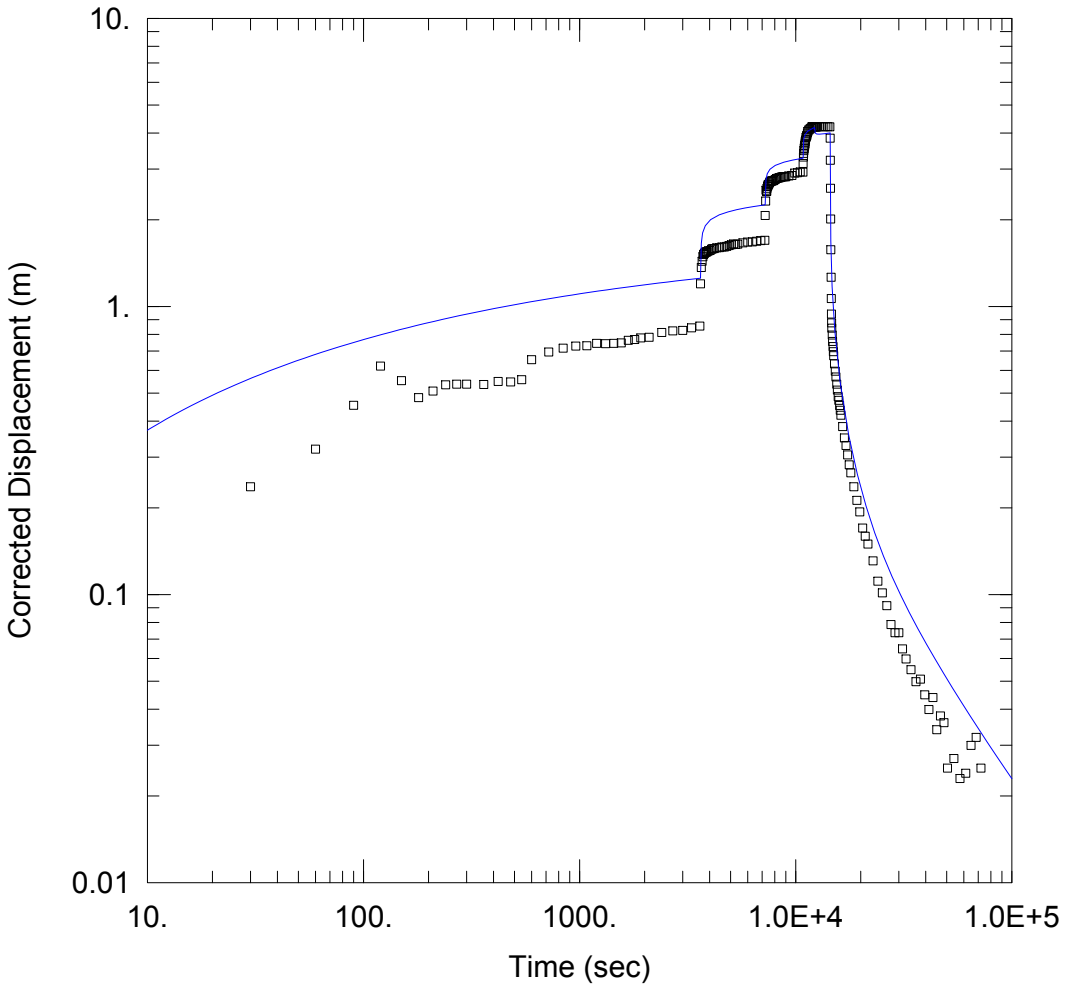
$sw(t)_{total}$ = Total drawdown in well 8.039 m

Q = Pumping rate 1.3 l/s

B(t) = Formation loss factor = B(t) = 4379 s/m^2 = 72.98 min/m^2

C = Well loss factor = C = 4271632 s^2/m^5 = 1186.564 min^2/m^5 Efficiency = $BQ/(BQ+CQ^2)$

Measured Values at 60 min into Step						Calculated Values at 60 min into Step					
Step	Q l/s	sw_{total} m	sw_{step} m	Q/sw_{total} l/s /m	sw/Q s/m^2	BQ ("Formation Loss") m	CQ^2 ("Well Loss") m	sw_{total} ("Combined Loss") m	Q/sw_{total} l/s /m	sw/Q s/m^2	Efficiency %
0	0	0	0	0	0	0	0	0	0	0	NA
1	0.40	0.90	0.90	0.44	2,258	1.75	0.68	2.43	0.16	6,087	72%
2	0.70	1.92	1.01	0.37	2,737	3.07	2.09	5.16	0.14	7,369	59%
3	1.00	3.77	1.86	0.27	3,773	4.38	4.27	8.65	0.12	8,650	51%
4	1.30	8.04	4.27	0.16	6,184	5.69	7.22	12.91	0.10	9,932	44%



WELL TEST ANALYSIS

Data Set: P:\...\BH5008P_unconfined_Theis.aqt
Date: 07/29/16 Time: 10:51:14

PROJECT INFORMATION

Company: Beca
Client: NZTA
Project: 4216210
Location: EWL
Test Well: BH5008P
Test Date: 12/07/16

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
BH5008P	0	0

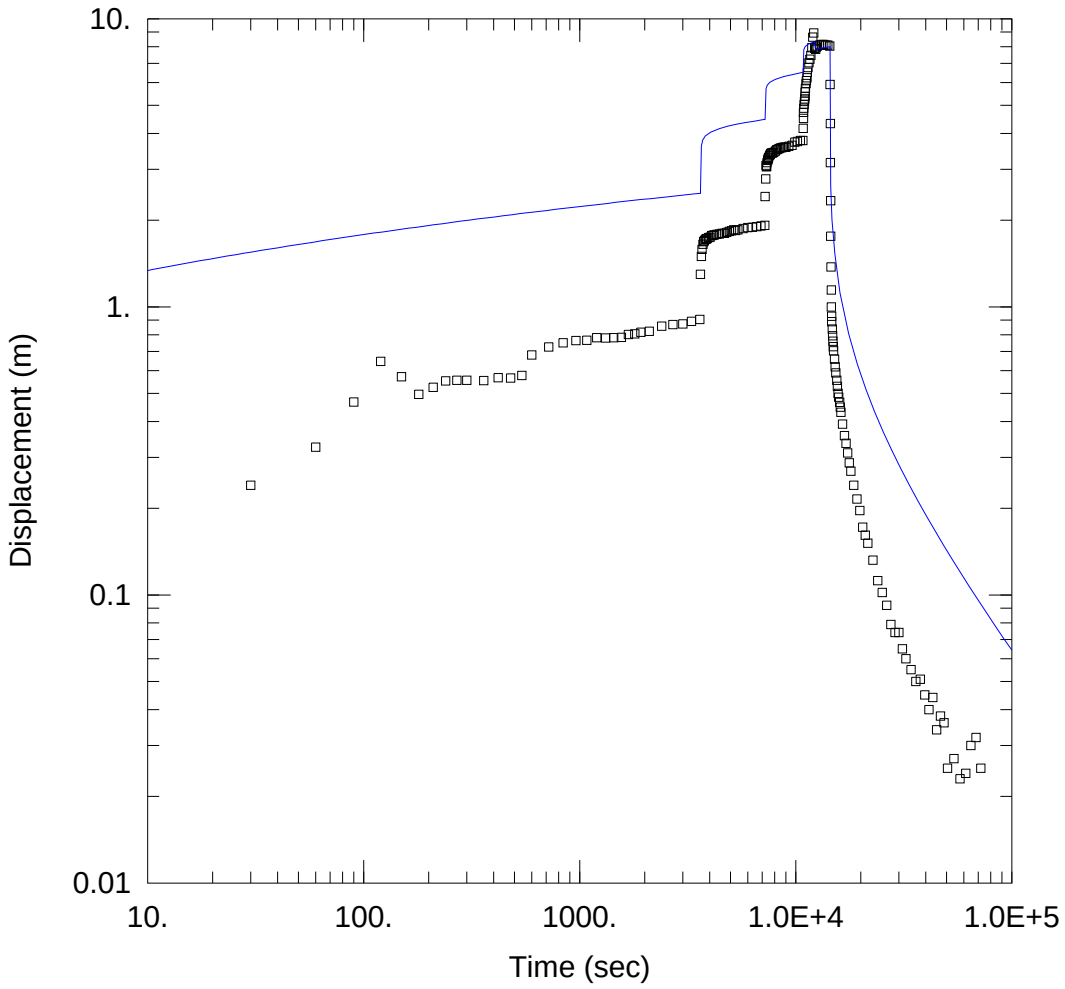
Observation Wells

Well Name	X (m)	Y (m)
▫ BH5008P	0	0

SOLUTION

Aquifer Model: Unconfined
Solution Method: Theis

T = 39.54 m^2/day
S = 0.2808
Kz/Kr = 1.
b = 8.426 m



WELL TEST ANALYSIS

Data Set: P:\...\BH5008P_unconfined_Moench.aqt
Date: 08/26/16 Time: 12:31:59

PROJECT INFORMATION

Company: Beca
Client: NZTA
Project: 4216210
Location: EWL
Test Well: BH5008P
Test Date: 12/07/16

AQUIFER DATA

Saturated Thickness: 8.426 m Anisotropy Ratio (Kz/Kr): 3810.2

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
BH5008P	0	0

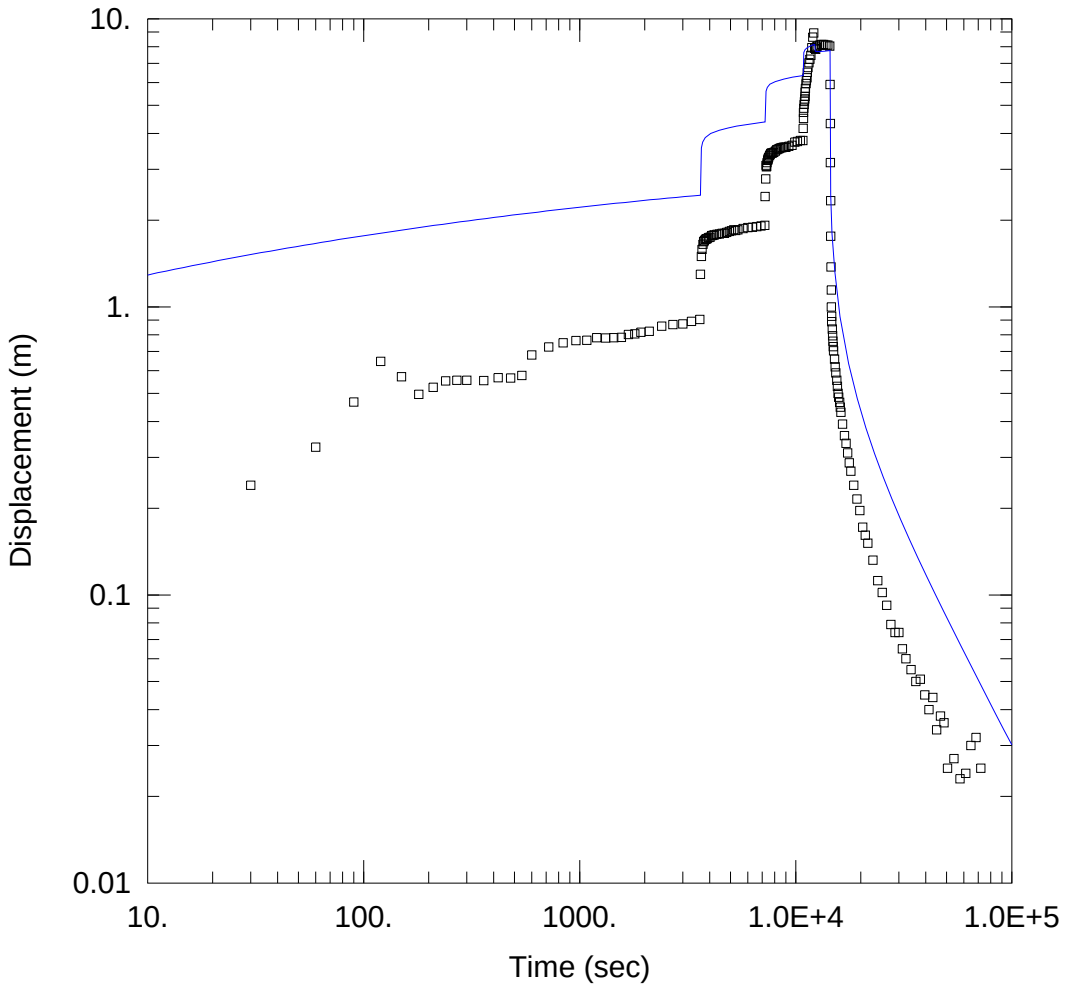
Observation Wells

Well Name	X (m)	Y (m)
▫ BH5008P	0	0

SOLUTION

Aquifer Model: Unconfined Solution Method: Moench

T = 14.13 m^2/day S = 0.001065
Sy = 0.001 Kz/Kr = 3810.2



WELL TEST ANALYSIS

Data Set: P:\...\BH5008P_unconfined_Tartakovsky-Neuman.aqt
Date: 08/26/16 Time: 12:37:10

PROJECT INFORMATION

Company: Beca
Client: NZTA
Project: 4216210
Location: EWL
Test Well: BH5008P
Test Date: 12/07/16

AQUIFER DATA

Saturated Thickness: 8.426 m Anisotropy Ratio (Kz/Kr): 0.001

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
BH5008P	0	0

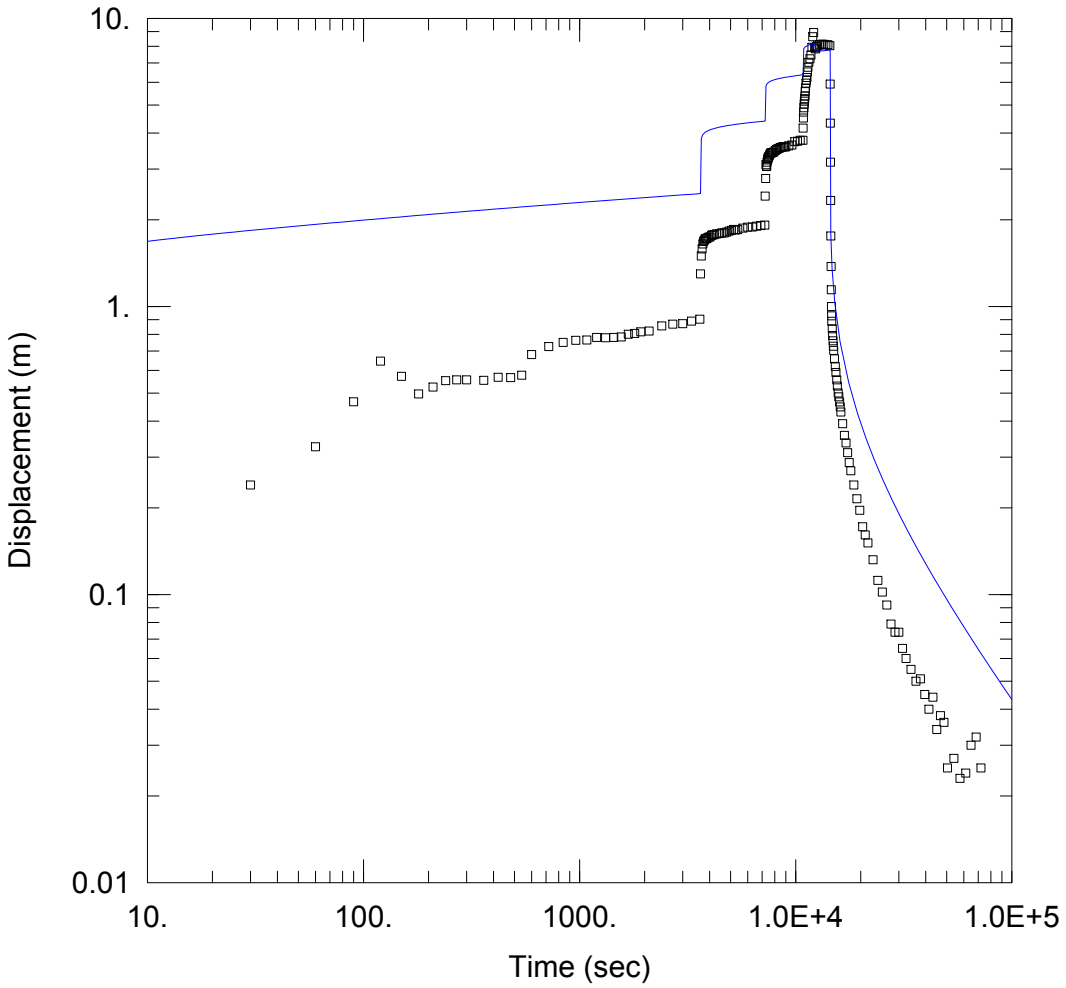
Observation Wells

Well Name	X (m)	Y (m)
BH5008P	0	0

SOLUTION

Aquifer Model: Unconfined
Solution Method: Tartakovsky-Neuman

T = 36.5 m^2/day
S = 0.003705
Sy = 0.001
Kz/Kr = 0.001



WELL TEST ANALYSIS

Data Set: P:\...\BH5008P_leaky_Hantush.aqt
Date: 07/29/16 Time: 12:10:02

PROJECT INFORMATION

Company: Beca
Client: NZTA
Project: 4216210
Location: EWL
Test Well: BH5008P
Test Date: 12/07/16

AQUIFER DATA

Saturated Thickness: 5.786 m
Aquitard Thickness (b'): 1.5 m
Anisotropy Ratio (Kz/Kr): 1.
Aquitard Thickness (b"): 1. m

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
BH5008P	0	0

Observation Wells

Well Name	X (m)	Y (m)
▫ BH5008P	0	0

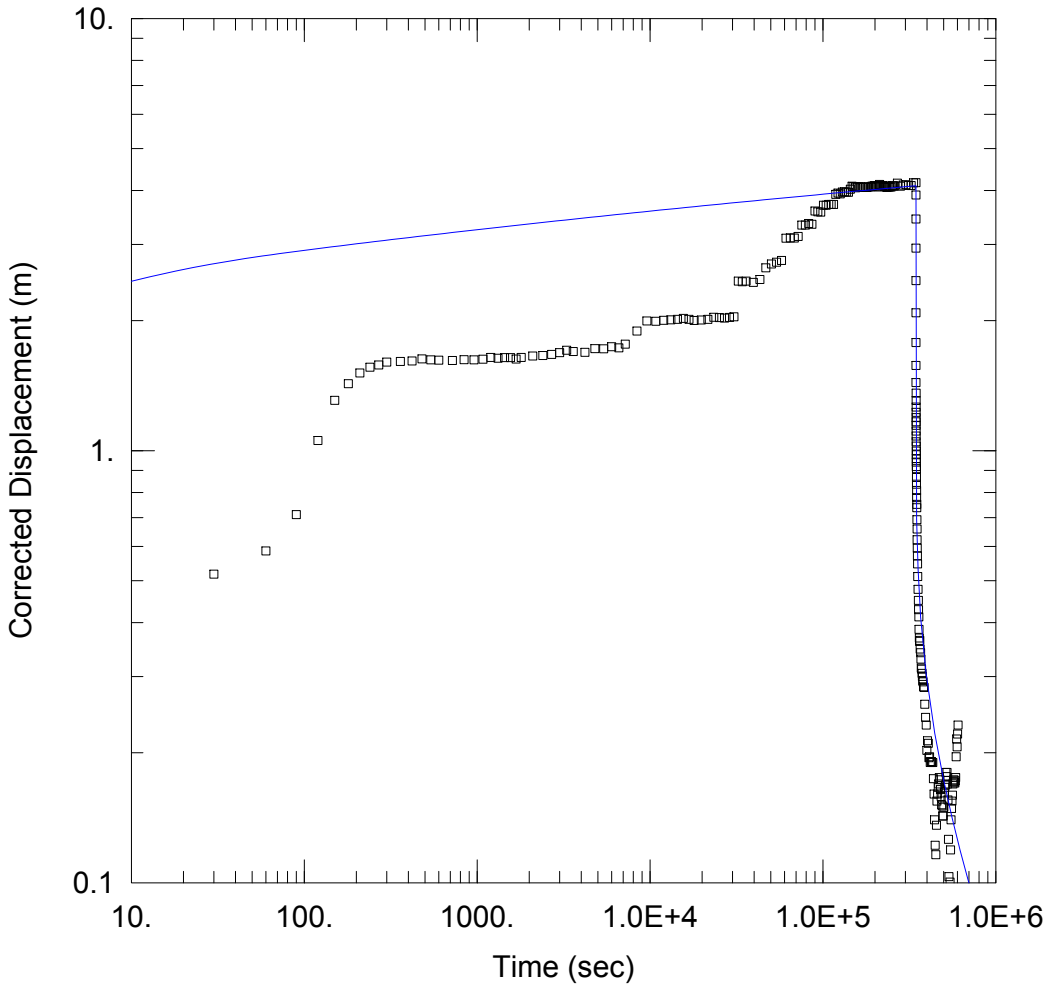
SOLUTION

Aquifer Model: Leaky
Solution Method: Hantush-Jacob

T = 20.99 m^2/day
1/B = 0.0001333 m^{-1}
C = 1. sec^2/m^5

S = 0.0004675
Sw = 0.
P = 1.5

Step Test Model: Jacob-Rorabaugh
$s(t) = 3150.4Q + 1.Q^{1.5}$



WELL TEST ANALYSIS

Data Set: C:\...\BH5008_unconfined_DD+Recovery.aqt
Date: 08/03/16 Time: 14:48:00

PROJECT INFORMATION

Company: Beca
Client: NZTA
Project: 4216210
Location: EWL
Test Well: BH5008P
Test Date: 12/07/16

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
BH5008P	0	0

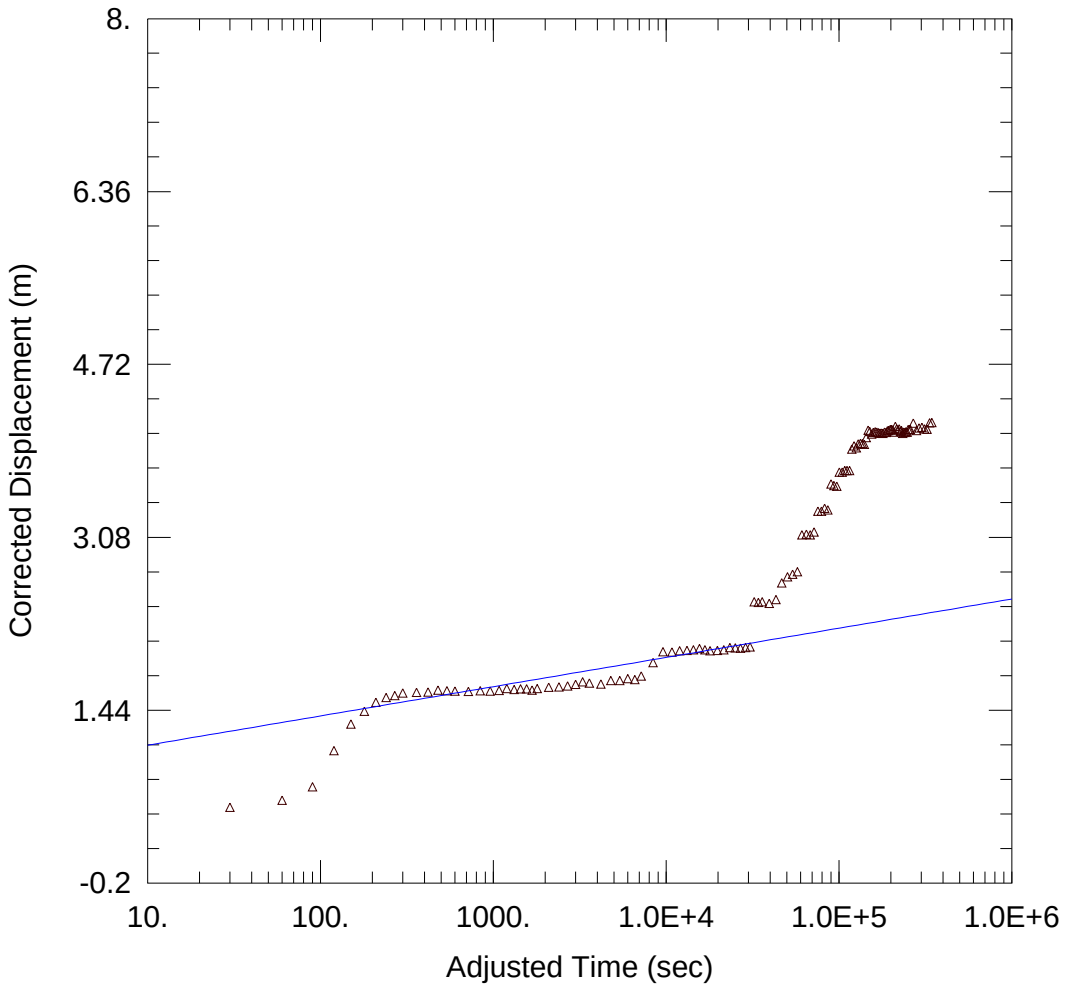
Observation Wells

Well Name	X (m)	Y (m)
▫ BH5008P	0	0

SOLUTION

Aquifer Model: Unconfined
Solution Method: Theis

T = 46.9 m^2/day
S = 0.001969
Kz/Kr = 1.
b = 8.426 m



WELL TEST ANALYSIS

Data Set: P:\...\BH5008_unconfined_Cooper-Jacob.aqt
Date: 08/26/16 Time: 13:14:04

PROJECT INFORMATION

Company: Beca
Client: NZTA
Project: 4216210
Location: EWL
Test Well: BH5008P
Test Date: 12/07/16

AQUIFER DATA

Saturated Thickness: 8.426 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
BH5008P	0	0

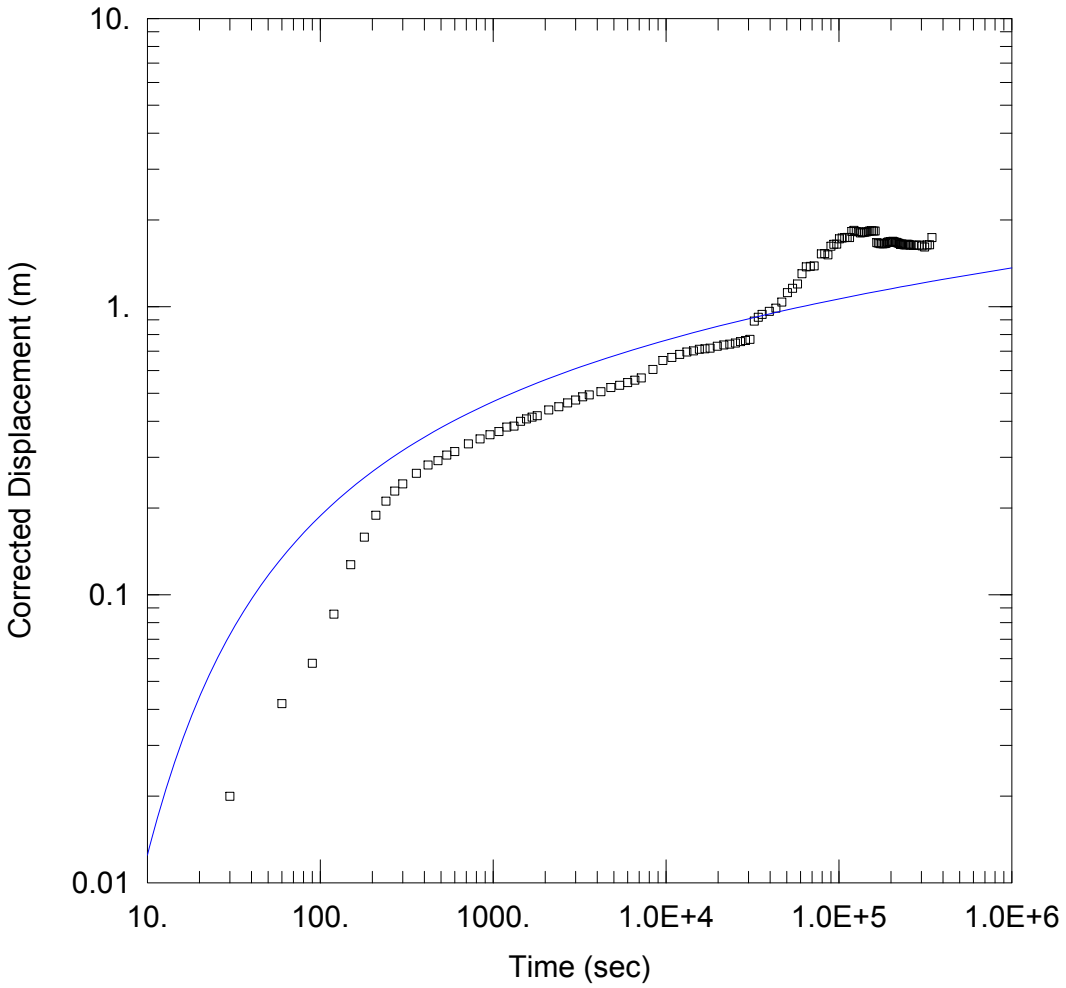
Observation Wells

Well Name	X (m)	Y (m)
△ BH5008P	0	0

SOLUTION

Aquifer Model: Unconfined Solution Method: Cooper-Jacob

T = 57.05 m^2/day S = 0.0002695



WELL TEST ANALYSIS

Data Set: P:\...\BH5008_unconfined_Theis.aqt
Date: 08/02/16 Time: 14:59:23

PROJECT INFORMATION

Company: Beca
Client: NZTA
Project: 4216210
Location: EWL
Test Well: BH5008P
Test Date: 12/07/16

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
BH5008P	0	0

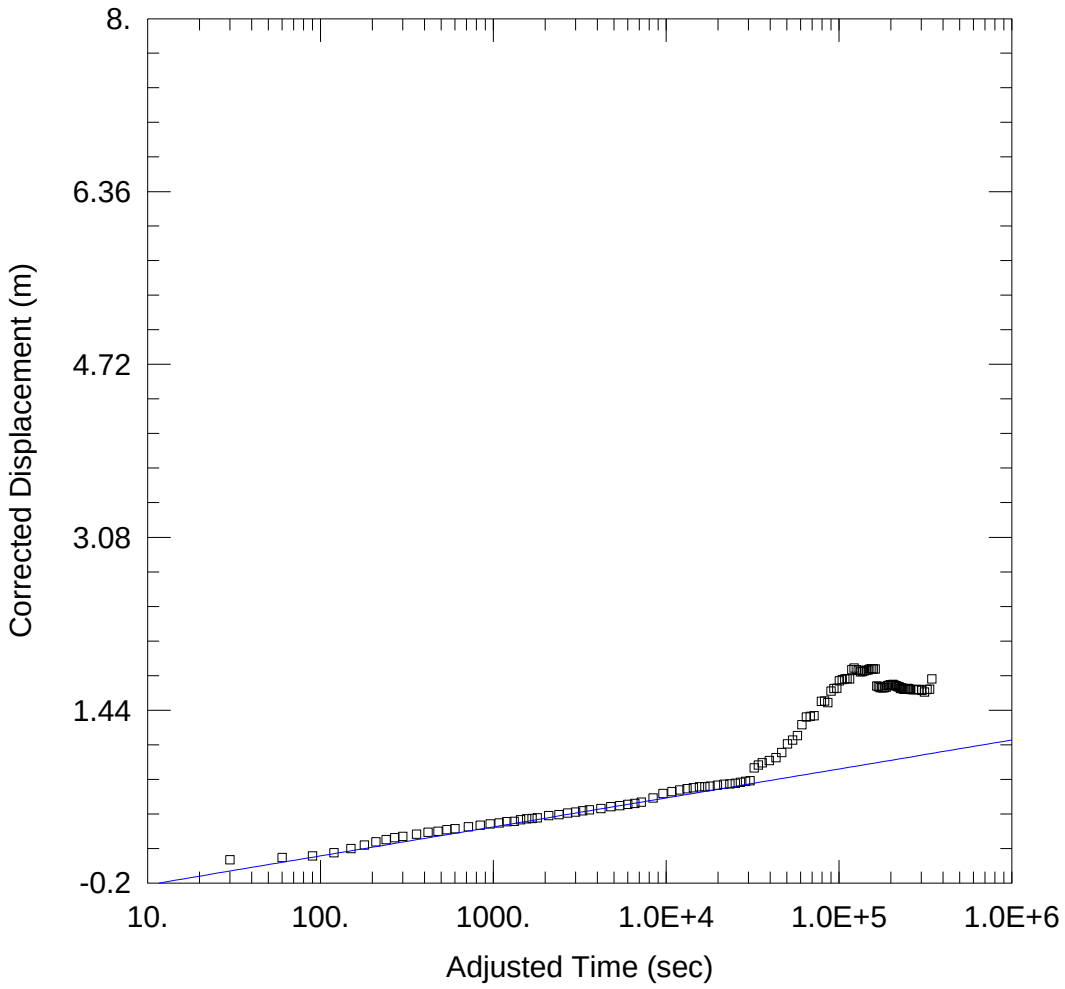
Observation Wells

Well Name	X (m)	Y (m)
BH5008	5.8	0

SOLUTION

Aquifer Model: Unconfined
Solution Method: Theis

T = 52.97 m^2/day
S = 0.001223
Kz/Kr = 1.
b = 8.426 m



WELL TEST ANALYSIS

Data Set: P:\...\BH5008_unconfined_Cooper-Jacob.aqt
Date: 08/26/16 Time: 13:09:08

PROJECT INFORMATION

Company: Beca
Client: NZTA
Project: 4216210
Location: EWL
Test Well: BH5008P
Test Date: 12/07/16

AQUIFER DATA

Saturated Thickness: 8.426 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
BH5008P	0	0

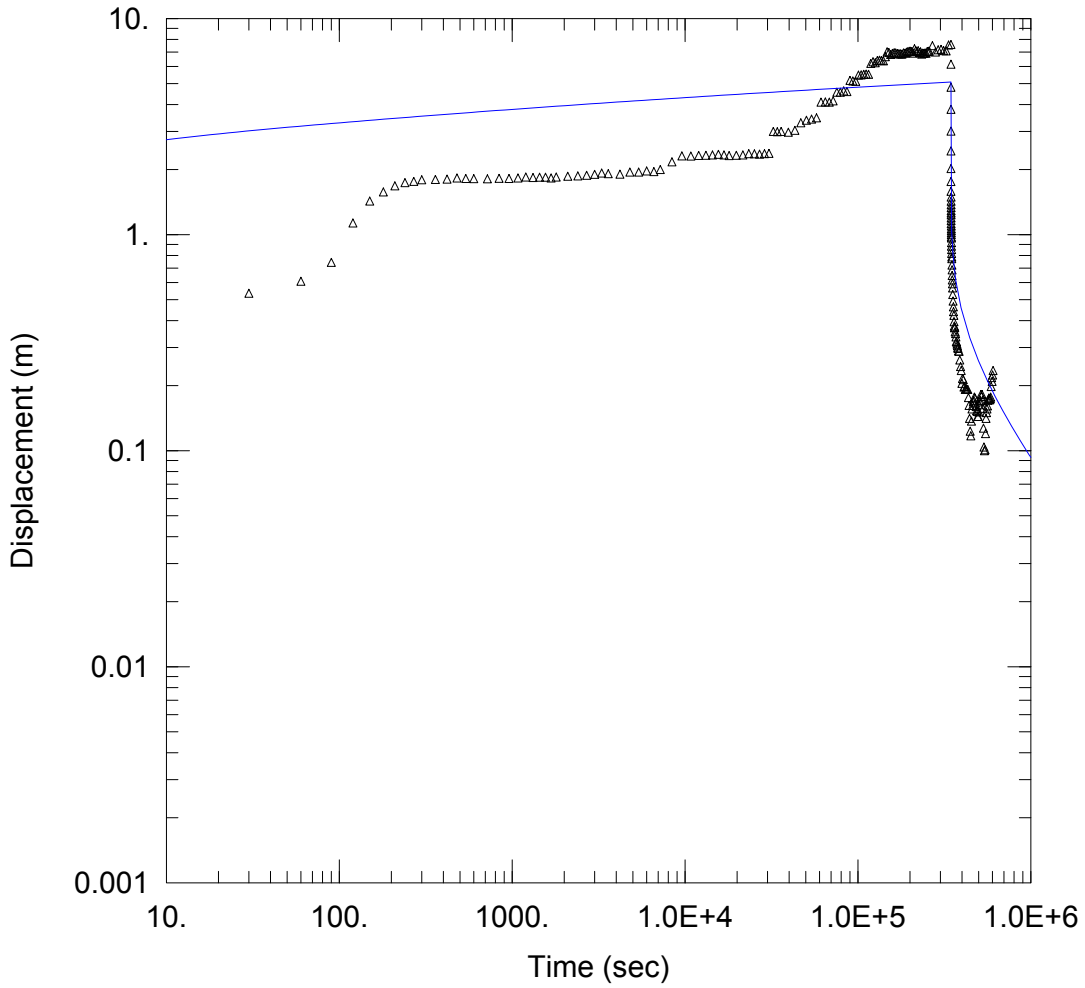
Observation Wells

Well Name	X (m)	Y (m)
BH5008	5.8	0

SOLUTION

Aquifer Model: Unconfined Solution Method: Cooper-Jacob

T = 57.61 m^2/day S = 0.002762



WELL TEST ANALYSIS

Data Set: C:\...\BH5008_confined_DD+recovery.aqt
Date: 08/04/16 Time: 13:24:57

PROJECT INFORMATION

Company: Beca
Client: NZTA
Project: 4216210
Location: EWL
Test Well: BH5008P
Test Date: 12/07/16

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
BH5008P	0	0

Observation Wells

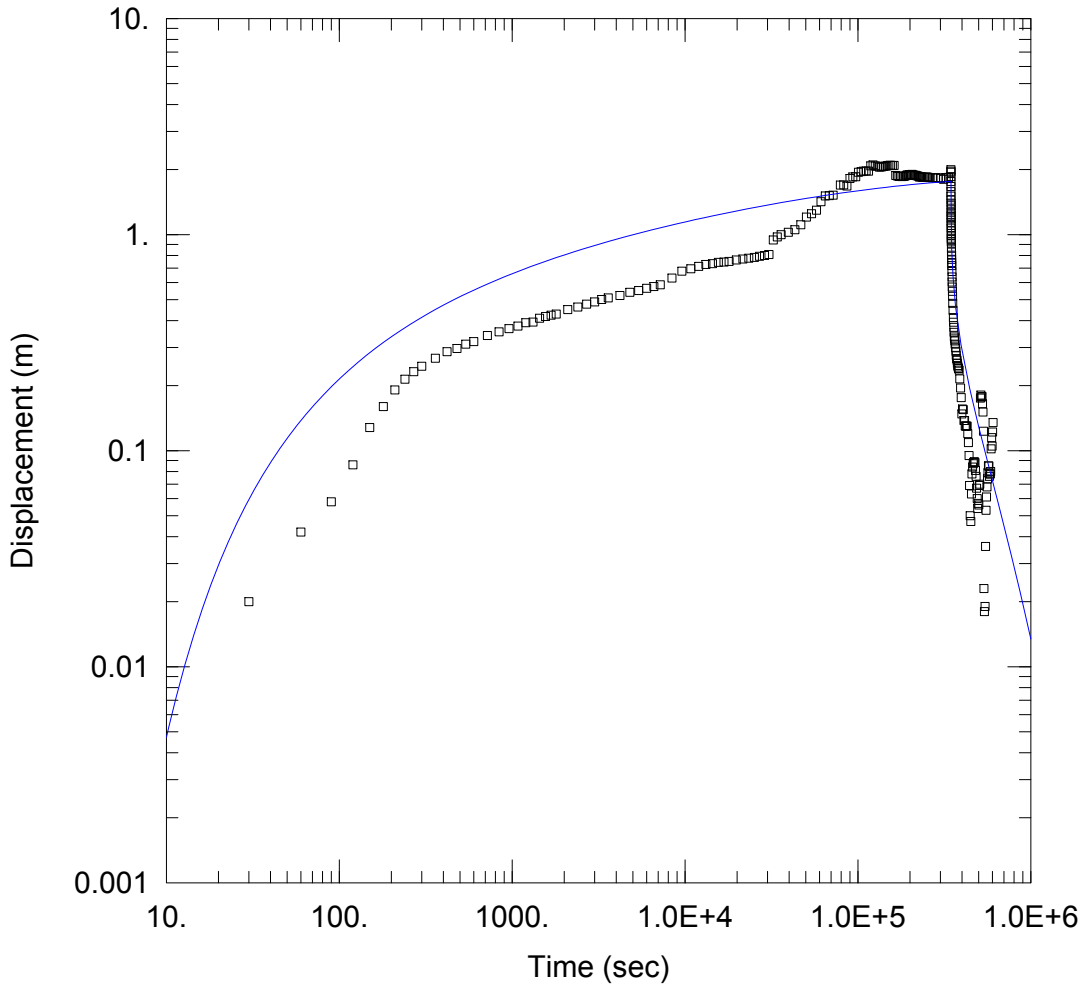
Well Name	X (m)	Y (m)
△ BH5008P	0	0

SOLUTION

Aquifer Model: Leaky
Solution Method: Hantush-Jacob

T = 31.19 m^2/day
1/B = 0.0001333 m^{-1}
b = 6.2 m

S = 0.001223
Kz/Kr = 1.



WELL TEST ANALYSIS

Data Set: C:\...\BH5008_confined_DD+recovery.aqt
Date: 08/04/16 Time: 13:26:23

PROJECT INFORMATION

Company: Beca
Client: NZTA
Project: 4216210
Location: EWL
Test Well: BH5008P
Test Date: 12/07/16

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
BH5008P	0	0

Observation Wells

Well Name	X (m)	Y (m)
BH5008	5.8	0

SOLUTION

Aquifer Model: Leaky
Solution Method: Hantush-Jacob

T = 31.99 m^2/day
1/B = 0.002805 m^{-1}
b = 6.2 m

S = 0.001223
Kz/Kr = 1.

Appendix A6

Consented Groundwater Takes in the Project Area

TAKE ID	EASTING (NZTM)	NORTHING (NZTM)	CONSENT HOLDER	PROPERTY ADDRESS	ANNUAL ALLOWANCE (m3/d)	DAILY ALLOWANCE (m3/d)	USE TYPE
2308	1763680	5910965	Auckland Meat Processors Limited	851 Great South Road Mount Wellington Auckland Central	304050	1404	Industrial Use
2308	1763730	5911004	Auckland Meat Processors Limited	851 Great South Road Mount Wellington Auckland Central	304050	1404	Industrial Use
4425	1764023	5911056	Auckland Council	645 Mount Wellington Highway Mount Wellington Auckland Central	12000	250	Sports Fields Irrigation
4106	1759170	5911760	Kris Grahame Bostock	30 Galway St Onehunga Auckland Central	100000	400	Industrial Use
2237	1759542	5912032	Bumper Replacements (NZ) Ltd	92 Princes St Onehunga Auckland Central	7530	30	Industrial Use
2283	1761991	5912067	Oji Fibre Solutions (NZ) Limited	33 Hugo Johnston Drive Penrose Auckland Central	675250	2000	Industrial Use
20847	1762226	5912453	Southpark Utilities Limited	8 Hugo Johnston Drive Penrose Auckland Central	905820	3000	Industrial Use
20847	1762183	5912455	Southpark Utilities Limited	8 Hugo Johnston Drive Penrose Auckland Central	905820	3000	Industrial Use
20847	1762250	5912460	Southpark Utilities Limited	8 Hugo Johnston Drive Penrose Auckland Central	905820	3000	Industrial Use
20847	1762248	5912470	Southpark Utilities Limited	8 Hugo Johnston Drive Penrose Auckland Central	905820	3000	Industrial Use
20847	1762199	5912494	Southpark Utilities Limited	8 Hugo Johnston Drive Penrose Auckland Central	905820	3000	Industrial Use
20847	1762258	5912520	Southpark Utilities Limited	8 Hugo Johnston Drive Penrose Auckland Central	905820	3000	Industrial Use
4496	1761512	5912718	Regional Facilities Auckland Ltd	2 Beasley Avenue Penrose Auckland Central	12500	90	Sports Fields Irrigation
21092	1761792	5912752	Auckland Stadiums c/- James Parkinson	2 Beasley Avenue Penrose Auckland Central	10000	70	Sports Fields Irrigation
4582	1760626	5912884	Winstone Wallboards Limited	41 Felix St Te Papapa Auckland Central	150000	450	Industrial Use
2257	1761530	5913050	*Fletcher Building Products Ltd* T/A Plycoselect -*DO NOT USE*	1 O'Rorke Road Penrose Auckland Central	350000	1440	Industrial Use
2234	1759402	5912042	Watercare Services Limited	ROWE STREET ONEHUNGA Auckland City	6950000	20000	Public water supply
2227	1758952	5912052	Watercare Services Limited	Pearce St Onehunga Auckland City		13000	Public water supply
2229	1758982	5912102	Watercare Services Limited	Public water supply Upper Municipal St Onehunga Auckland Central		3000	Public water supply

TAKE ID	EASTING (NZTM)	NORTHING (NZTM)	CONSENT HOLDER	PROPERTY ADDRESS	ANNUAL ALLOWANCE (m3/d)	DAILY ALLOWANCE (m3/d)	USE TYPE
2228	1758880	5912080	Watercare Services Limited	Public Water Supply Lower Municipal St Onehunga Auckland Central		7000	Public water supply
20431	1761370	5913160	*Fletcher Building Products Ltd* T/A Plycoselect -*DO NOT USE*	1 O'Rorke Road Penrose Auckland Central	52000	250	Industrial Use
20257	1762140	5913589	Tasman Insulation New Zealand Ltd	9 Holloway Place Mount Wellington Auckland Central	66000	220	Industrial Use
2251	1761072	5913656	Industrial Electroplaters Ltd	49 Walls Road Penrose Auckland Central	8600	24	Industrial Use
21010	1762411	5914250	Fulton Hogan Limited	4 Reliable Way Mount Wellington Auckland Central	15000	60	Other
21014	1762725	5914530	Summerset Villages (Ellerslie) Ltd	8 Harrison Road Mount Wellington Auckland Central	4000	212	Pastoral Irrigation
21067	1759834	5914646	Ryman Healthcare Limited	187 Campbell Road Greenlane Auckland Central	5000	50	Other
4476	1760964	5914908	Ellerslie Bowling Club Inc	20 Kalmia St Ellerslie Auckland Central	2000	25	Bowling Green Irrigation
4187	1762868	5915562	Ryman Healthcare Limited	221 Abbotts Way Remuera Auckland Central	41000	420	Bowling Green Irrigation

Appendix A7

Groundwater Level Records Used for Steady State Calibration

Group 1: Auckland Council Monitoring Bores

Name	Coordinates (easting and northing, NZTM)		Average groundwater level (mRL)
OBC8_Selwyn_St	1758773	5912981	17.7
Tiwai_Rd	1758792	5913758	15.8
Rowe_St	1759381	5911988	2.7
Alfred_St	1759803	5912783	4.5
Cemetery	1759907	5911512	1.65
Mays_Road	1760149	5912796	4.7
Te_Papapa	1760336	5912338	5.1
OBC1_Wallath_St	1760581	5913666	9.5
Horizon_Yarns	1760626	5911833	2.9
Angle_St	1760818	5911693	2.4
Central_Park_A	1761096	5914568	16.6
Tanner_Reserve	1761379	5913604	11.78
Simpson_Resrv	1762358	5912203	4.25

Group 2: Geotechnical Database

Name	Coordinates (easting and northing, NZTM)		Average groundwater level (mRL)
HUN1_P	1759170	5911437	1.9
HUN4_P	1759214	5911562	2.1
HUN15_P4	1759238	5912166	3.7
HUN15_P2	1759437	5912178	3.6
HUN16_P	1759616	5912262	3.4
HUN15_P1	1759621	5912226	2.8
HUN13_P	1759639	5912008	3.5
HUN10_P	1759644	5911771	1.9
HUN12_P	1759646	5911902	1.7
HUN15_P3	1759834	5912234	5.1
AC_20375	1759960	5911680	1.2
AC_21872	1760218	5911953	3.5
AC_22170	1760378	5912020	4.4
AC_22158	1760530	5911410	2.3
AC_737	1760600	5911820	2.2
AC_952	1760700	5911500	1.7
AC_20374	1760840	5911620	2.3
DORMW3	1761125	5911626	3.3
AC_20297	1761128	5911510	4
MB3	1761410	5911890	3.4
3290050_TP34	1761439	5911865	2.4
3290050_MB04	1761461	5911924	2.3
TP20	1761498	5911845	1.7
SKMBH10	1761546	5911454	4.3
SKMBH17	1761570	5911495	3.4
3290050_TP22	1761575	5911906	2.1
SKMBH12	1761703	5911501	2.7
SKMBH13	1761884	5911464	3.4
AC_4594	1761900	5912600	9.5
SKMBH14	1761964	5911503	4.3
SKMBH15	1762053	5911524	4.8
AC_21953	1762104	5912620	13
AC_4540	1762200	5912375	4.2
AC_4541	1762376	5912232	5.1
AC_5513	1762594	5912768	4.8
AC_5676	1762610	5912890	8.7
AC_22369	1762706	5912458	8.3
2930234_BH07	1764178	5913000	3
2930234_BH02	1764436	5913030	14.4

Group 3: Project piezometers

Name	Coordinates (easting and northing, NZTM)		Average groundwater level (mRL)	Groundwater level range (mRL)	Datalogger installed	Piezometer tidal range (m)
BH2001	1762443	5911681	1.86	1.86 – 1.87		
BH2002	1762517	5911623	1.4	2.15 – 2.19		
BH2003	1762871	5911741	2.68	2.5 – 2.77		
BH2004	1763156	5911834	1.91	1.85 – 1.98		
BH2005	1763598	5912012	7.24	7.17 – 7.32		
BH2007	1763780	5912206	9.75	9.69 – 9.78		
BH2008	1763912	5912156	8.12	8.12		
BH2011	1764137	5912354	5.89	5.53 – 6.73		
BH2012	1764170	5912406	5.96	5.96		
BH2014	1764406	5912290	7.48	7.48		
BH2016	1764480	5912200	8.61	8.26 – 8.97		
BH2017	1764687	5911719	7.31	7.28 – 7.35		
BH2018	1764645	5911643	7.65	7.60 – 7.74		
BH2023	1761207	5911587	2.21	2.21		
BH2027	1758804	5911236	0.84	0.78 – 0.95		
BH2028	1758753	5911339	1.08	1.03 – 1.12	Yes	0.02 – 0.03
BH2029	1758689	5911610	1.27	1.27		
BH2030	1758746	5911751	2.19	2.09 – 2.25		
BH2031	1759263	5911507	1.73	1.65 – 1.77		
BH2032	1760461	5911291	2.1	2.06 – 2.15		
BH2033	1764001	5912225	8.11	8.11		
BH2034	1763948	5912444	8.97	8.97		
BH4001	1758971	5911829	2.74	2.65 – 2.79	Yes	< 0.01
BH4002	1759539	5911763	1.88	1.82 – 2.02	Yes	0.01 – 0.02
MW17	1759556	5911768	2.08	1.97 – 2.17		
MW6	1759582	5911770	2.17	2.03 – 2.24		
MW6a	1759583	5911770	2.18	2.05 – 2.25		
BH4003	1759676	5912002	2.64	2.58 – 2.67	Yes	< 0.01 – 0.03
BH4003A	1759681	5912003	2.56	2.52 – 2.58	Yes	< 0.01 – 0.03
BH4004	1759926	5911733	2.34	2.31 – 2.36		
BH4004A	1759924	5911730	2.02	1.86 – 2.14		
BH4005	1760287	5912143	4.3	4.11 – 4.35	Yes	
BH4006	1760166	5911770	2.85	2.66 – 2.97	Yes	< 0.01 – 0.02
BH4007	1760712	5912112	6.15	6.04 – 6.24	Yes	< 0.01 – 0.02
BH4008	1760694	5911867	4.58	4.43 – 4.84	Yes	< 0.01
BH4009	1760935	5911420	2.01	1.94 – 2.12	Yes	< 0.01 – 0.03
BH4010	1761124	5911891	3.79	3.75 – 3.95	Yes	< 0.01 – 0.02
BH4010A	1761127	5911893	3.72	3.60 – 3.74	Yes	0.01 – 0.02
BH4011	1761604	5911808	3.11	2.99 – 3.14	Yes	< 0.01
BH4011A	1761605	5911811	2.96	2.96 – 3.08	Yes	< 0.01

Name	Coordinates (easting and northing, NZTM)		Average groundwater level (mRL)	Groundwater level range (mRL)	Datalogger installed	Piezometer tidal range (m)
BH4012	1762095	5911877	2.84	2.84 – 2.92	Yes	< 0.01 – 0.015
BH5001	1759620	5911275	1.9	1.82 – 1.91	Yes	< 0.01
BH5002	1759612	5911507	2.08	1.97 – 2.12	Yes	0.01 – 0.015
BH5002A	1759611	5911508	1.86	1.71 – 1.93	Yes	0.01 – 0.06
BH5003	1759658	5911662	2.1	1.89 – 2.16	Yes	< 0.01 – 0.015
BH5004	1760800	5911266	1.9	1.73 – 1.95		
BH5005	1760431	5911525	2.33	2.12 – 2.44		
BH5005A	1760435	5911525	2.76	2.53 – 2.87		
BH5006	1760427	5911609	1.98	1.89 – 2.02		
BH5007	1761267	5911287	1.54	1.54		
BH5008	1761212	5911419	1.92	1.86 – 2.41	Yes	< 0.01 – 0.02
BH5008A	1761215	5911417	2.41	2.25 – 2.50		

Appendix B

Groundwater Quality Memorandum

East West Link Alliance Memorandum

To:	Ann Williams	**Date:**	15/09/2016
From:	Wijinand Udema	**Our Ref:**	5133673
Copy:			
Subject:	Groundwater Quality		

1 Groundwater Quality

1.1 Purpose

This appendix summarises the groundwater and leachate quality field investigation results carried out as part of the hydrogeological assessment of the project area's existing environment.

The proposed alignment is located over an area which includes current and historical contaminated and potentially contaminated sites as identified in Technical Report 17 - Contaminated Land.

1.2 Previous Contamination Studies

Groundwater contamination through the Onehunga and Te Papapa area is reasonably well understood at an individual site level, although there has never been a complete assessment of the catchment until now. Site-specific studies have included off-site investigations of plumes and analysis of the connection between groundwater and stormwater. Some of the more comprehensive studies have addressed:

- Pikes Point Landfills
- Former New Zealand Farmers Fertilisers site bounded by Church Street, Mays Road and the railway line
- Former Mobil Service Station, now Drycleaners, corner of Onehunga Mall and Neilson Street
- Century Yuasa Batteries, 259 Church Street
- Graham Lowe Tannery, 102-104 Neilson Street

A brief overview of these sites (other than the landfills) is provided below.

1.2.1 Former New Zealand Farmers Fertilisers

Operated from 1910 to 1984 and manufactured, stored and handled fertiliser products. In 1988, contamination was observed in stormwater which turned the Miami stream green in colour and was traced back to the NZFF site by the Council. Subsequent investigations have documented a large plume of groundwater contamination[1]. The "Onehunga Aquifer" is number six on the Ministry for the Environment Contaminated Sites Remediation Fund priority list. More than $1M has been spent on environmental investigations, managed by Auckland Council. Remediation has not been undertaken, and the former manufacturing site has now been redeveloped into medium density residential land use.

The former processes at the NZFF operation led to discharges into the Manukau Harbour via the stormwater network. Groundwater beneath the site was impacted by surface discharges percolating down through the soil and basalt profile, and heavy metals including cadmium and copper are found in the acidic groundwater. A plume of sulphate and fluoride extends approximately 500 m south of the site towards the Manukau Harbour. The Patrick Street

[1] URS, 2010, Green Stream Groundwater Plume Characterisation and Risk Assessment

stormwater line was identified as acting as a preferential pathway for contaminant migration. Key groundwater contaminants identified included copper, sulphate, cadmium, fluoride, phosphorus, and low pH (acidity).

1.2.2 Former Mobil Service Station

The site is located on the corner of Onehunga Mall and Nielson Street and operated as a service station from approximately 1957 to 1991. The site was then leased by Mobil for use as a dry cleaners site from 1998 to 2005. Groundwater at the site is documented as having been impacted by hydrocarbons and chlorinated solvents. Golder reported in 2015[2] residual light non-aqueous phase liquid (LNAPL) in groundwater present within the factures of the basalt and residual concentrations of dissolved phase volatile chlorinated hydrocarbons. Impacts on groundwater have also been observed off site to the east, south and west, with an inferred groundwater flow direction towards the south.

1.2.3 Former Yuasa Batteries manufacturing site

The site was used for battery manufacture over at least five decades since 1949, and soil and groundwater beneath the site was contaminated with cadmium, lead and sulphuric acid. Following a site investigation and risk assessment by URS, a resource consent was issued[3] in 2001 to authorise the discharge of contaminated groundwater from the site. The groundwater parameters monitored under the consent are EC, pH, sulphate, chloride, lead, zinc, cadmium and copper.

The site is located hydraulically downgradient from the NZFF Site. Contaminants at the Yuasa site are similar to those of the NZFF site and the site is located on the western edge of the groundwater plume from NZFF. URS (2010) concluded that the Yuasa site groundwater plume is co-mingled with the NZFF plume of contaminants[3].

1.2.4 Graham Lowe Tannery

This site had been operating as a Tannery from about 1888, prior to which it was a wool mill. The site has known groundwater contamination issues including metals and nutrients.[4][5]

1.2.5 Summary

As recorded in the PSI, there are many other sites in the area that may have impacted groundwater. The summary above provides some examples of the practices that have led to groundwater contamination in the Onehunga / Te Papapa area. From the widespread former and current HAIL sites in the area it is considered that the groundwater is generally impacted by historic and current industrial and commercial land uses

The groundwater in this area is also impacted by the numerous historical reclamations and landfills. Detailed information on the environmental status of the landfills is relatively limited overall.
However some information is available on closed municipal landfills, such as Galway Street and the Pikes Point landfills. Anecdotal and geotechnical investigations have shown that the landfills do not

---

[2] Golder Associates, 2015, Resource Consent Application and AEE – Discharge of contaminants to land and water

[3] Application Number 24110 by Century Yuasa (NZ) Ltd for consent to discharge contaminants to ground and groundwater from a battery manufacturing site at 259 Church Street, Onehunga. Tonkin & Taylor (2001).

[4] Tonkin & Taylor, 2014, 102 Neilson Street, Onehunga, Preliminary Site Investigation

[5] Groundwater and Environmental services, 2002, Site investigation report, 104 Neilson Street, Onehunga

incorporate modern engineered landfill design such as liners or caps. The landfills directly affected by the Project include:

- Galway Street Landfill (includes "75 Acre Reclamation")
- Pikes Point East reclamation and landfill
- Pikes Point West reclamation and landfill

In addition to the above reclamations there was also numerous other landfills[6] proximate to the project area including:

- Mount Smart Landfill
- Former One Tree Hill Borough Council Tip Site
- Former New Zealand Rail Landfill
- Church Street Closed Landfill

Areas of uncontrolled fill are also recognised at the Gloucester Reserve reclamation, Anns Creek and Otahuhu Creek, however these areas are not recognised by Auckland Council as landfills.

The presence of the landfills is also considered to have changed the natural flow of groundwater[7] and the water quality around these areas is influenced by landfill leachate constituents. Investigations completed for the Project have identified ammoniacal nitrogen in particular, which is a degradation product of organic waste.

1.3 Assessment Framework

This section provides an overview of the acceptance criteria that have been adopted for the evaluation of analytical data collected during the environmental investigations for the EWL project.

1.3.1 Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000)

The water guideline criteria provided by the ANZECC were developed with the intent of identifying protection levels for freshwater and marine ecosystems. The guidelines set out varying levels (99%, 95%, 90%, 80%) of protection depending on the level of aquatic ecosystem modification. In effect, at the 99% protection level, 99% of the species present in a pristine environment scenario would be protected.

For the purposes of our assessments (groundwater / leachate) we have adopted a 90% protection level as this is considered appropriate for the Mangere Inlet foreshore marine receiving environment which is moderately modified from its natural state (refer to Technical Report 16 - Ecological Impact Assessment).

It should be noted that the guidelines are not intended to be applied directly to point or diffuse sources of contamination entering the receiving environment; rather they are intended to be applied after "reasonable mixing". This approach is inherently difficult to assess or model, and therefore for simplicity we have used a direct comparison approach.

1.4 Methodology

[6] Earthtech 1993: Groundwater Investigation Scoping Report. Pikes Point Aftercare, Auckland Regional Council. Earthtech Consulting Limited, 11 June 1993. Ref 2112

[7] Schayen, SJ, 2004. Reclamation of land – Environmental aspects – New Zealand – Auckland; Groundwater Flow – New Zealand – Auckland; Saltwater encroachment – New Zealand – Auckland. Thesis (MSc – Geology) – University of Auckland.

The groundwater quality assessment (including leachate quality) was undertaken in conjunction with the hydrogeological and geotechnical investigations for the project.

In addition to the hydrogeological bores, monitoring wells were installed along three transects to investigate changes in groundwater quality as it passes through the existing landfills footprint towards Mangere inlet. Monitoring of these wells also allows the assessment of any potential connection between the leachate in the landfills and deeper groundwater in the basalt, and the potential connection to seawater.

Shallow monitoring wells located on the Onehunga foreshore were installed to assess impacts on water quality of discharges into the coastal marine area. This testing was coupled with chemical characterisation of notable seepages along the foreshore.

Groundwater

Details of the field investigation programme and sampling locations are provided in the Geotechnical and Geo-environmental Factual Report. In summary, the groundwater quality investigation comprised:

1. Review and compilation of existing information on groundwater quality in and around the Project Area

2. Drilling, installation, and development of groundwater monitoring boreholes;

3. Collection of groundwater and/or leachate samples from newly installed and existing (at Galway Street and Pikes Point Landfills) monitoring wells;

4. Measurement of field parameters during groundwater sample collection including pH, electrical conductivity, turbidity, oxidation reduction potential (REDOX), temperature and salinity;

5. Groundwater samples were cold held and dispatched under a standard chain of custody to Eurofins Laboratories for analysis;

6. Analytical testing of selected samples for metals, nutrients, inorganics, major ions, total petroleum hydrocarbons (TPH), semi volatile organic compounds (SVOC), volatile organic compounds (VOC), benzene, toluene, ethylbenzene, and xylenes (BTEX), monocyclic aromatic hydrocarbons (MAH), polycyclic aromatic hydrocarbons (PAH), organochlorine pesticides (OCP), and phenols;

7. Remaining samples were cold held at the laboratory in the event that follow up analysis was required;

8. Collation of groundwater analytical results and comparison with selected water quality acceptance criteria was undertaken. The following appendices are attached to this document:

Appendix B1 - Map showing the stiff diagrams demonstrating leachate and tidal signatures;

Appendix B2 – Stiff Plots

Appendix B3 - Analytical result tables

Appendix B4 – Map showing Auckland Council's monitoring wells and landfill leachate pumps.

The laboratory results documents are provided in the Geotechnical and Geo-Environmental Factual Report. An analytical testing inventory is contained in **Table 1**.

Table 1 - Analytical Testing Inventory - Groundwater Sampling

Location	Sample Date	Analytes
BH2001	24/05/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC
BH2002	24/05/2016 12/07/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC
BH2003	24/05/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC
BH2004	24/05/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC
BH2005	7/07/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC
BH2011	7/07/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC
BH2023	11/07/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC
BH2031	24/05/2016 11/07/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC
BH2032	18/05/2016 6/07/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC, Inorganics
BH2033	7/07/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC
BH4001	20/05/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC, Inorganics
BH4002	24/05/2016 11/07/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC
BH4003A	24/05/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC
BH4003	24/05/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC
BH4004A	20/05/2016 7/07/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC, Inorganics
BH4004	20/05/2016 7/07/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC, Inorganics
BH4005	24/05/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC
BH4006	20/05/2016 11/07/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC, Inorganics
BH4007	24/05/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC
BH4008	24/05/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC
BH4009	20/05/2016 7/07/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC, Inorganics
BH4010A	24/05/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC
BH4010	24/05/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC
BH4011A	24/05/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC
BH4011	24/05/2016 12/07/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC
BH4012	24/05/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC

BH5001	19/05/2016 6/07/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC, Inorganics
BH5001	24/05/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC
BH5002	6/07/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC
BH5002A	6/07/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC
BH5003	19/05/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC, Inorganics
BH5004	19/05/2016 6/07/2016	Metals, TPH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC
BH5005A	19/05/2016 6/07/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC, Inorganics
BH5005	19/05/2016 6/07/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC, Inorganics
BH5006	19/05/2016 6/07/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC, Inorganics
BH5007	6/07/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC, Inorganics
BH5008A	20/05/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC, Inorganics
BH5008	20/05/2016	BTEX & MAH, PAH, Nutrients
BH5008P	13/07/2016	Metals, TPH, BTEX & MAH, PAH, Nutrients, Major Ions, OCP, Phenols, SVOC/VOC, Inorganics

Leachate

Leachate sampling was undertaken at four Leachate Interception System pumpstations located at the Pikes Point Landfills along the Onehunga foreshore.

The landfill leachate pump station sampling investigation comprised:

- Collection of leachate samples from the four leachate pumping stations from Pikes Point West Closed Landfill (locations are shown in Appendix B4) using grab sampling techniques;
- Landfill leachate samples were cold held and dispatched under a standard chain of custody to Eurofins Laboratories for analysis;
- Analytical testing of selected samples for metals, nutrients, alkalinity, major ions, total petroleum hydrocarbons (TPH), semi volatile organic compounds (SVOC), volatile organic compounds (VOC), polycyclic aromatic hydrocarbons (PAH), organochlorine pesticides (OCP), and phenols;
- Remaining samples were cold held at the laboratory in the event that follow up analysis was required;
- Collation of landfill leachate analytical results and comparisons with selected water quality acceptance criteria was undertaken. The analytical results tables are attached as Appendix B3 to this document. The laboratory results are provided in the Geotechnical and Geo-Environmental Factual Report. An analytical testing inventory is contained in Table 2.

Table 2 - Analytical Testing Inventory - Landfill Leachate Pump Station Sampling

Location	Sample Date	Analytes
Pump 1	29/04/2016	Metals, TPH, PAH, Nutrients, Alkalinity, Major Ions, OCP, Phenols, SVOC/VOC
Pump 2	29/04/2016	Metals, TPH, PAH, Nutrients, Alkalinity, Major Ions, OCP, Phenols, SVOC/VOC
Pump 3	29/04/2016	Metals, TPH, PAH, Nutrients, Alkalinity, Major Ions, OCP, Phenols, SVOC/VOC
Pump 4	29/04/2016	Metals, TPH, PAH, Nutrients, Alkalinity, Major Ions, OCP, Phenols, SVOC/VOC

1.5 Results

1.5.1 Leachate Quality Assessments

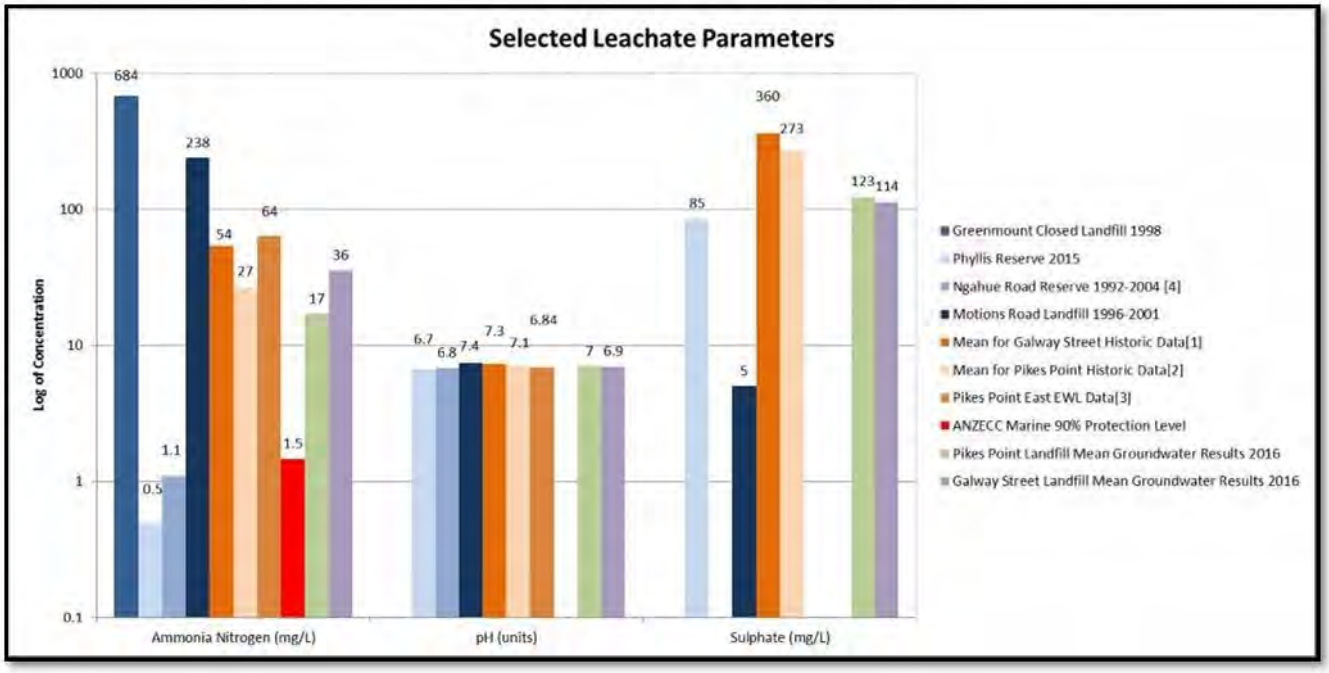


Figure 1 - Comparison of average dissolved concentrations of Ammonia Nitrogen, pH and Sulphate for EWL and Auckland City Landfills and ANZECC 90% Acceptance Criteria

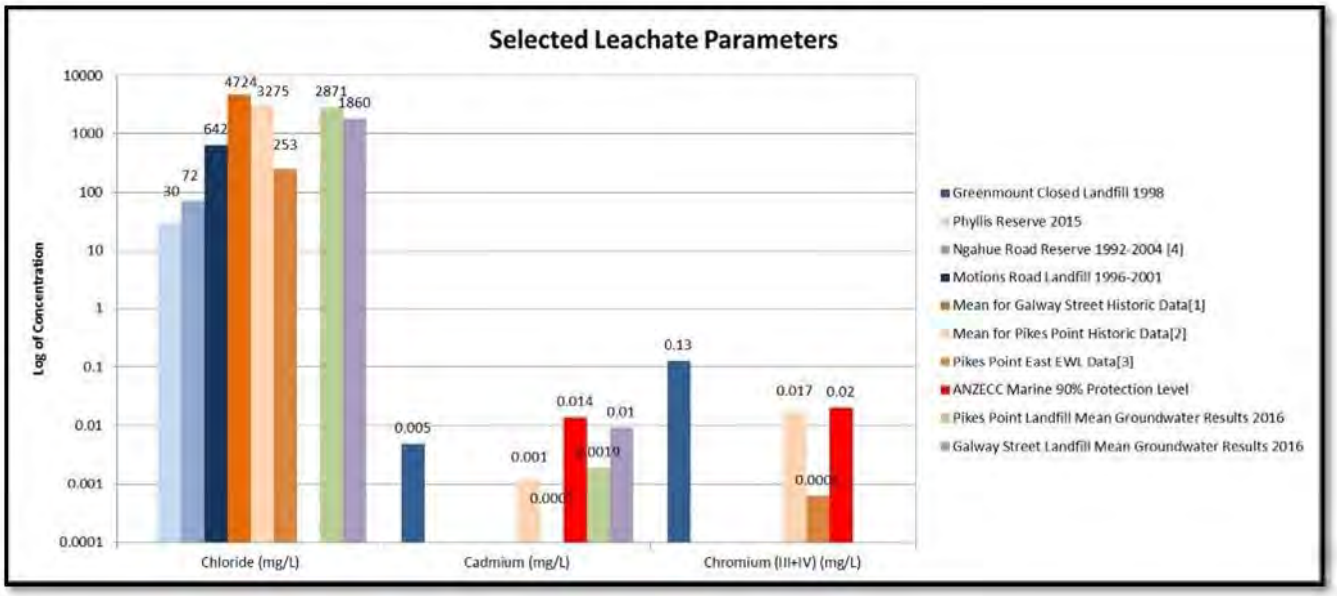


Figure 2 - Comparison of average dissolved concentrations of Chloride, Cadmium and Chromium for EWL and Auckland City Landfills and ANZECC 90% Acceptance Criteria

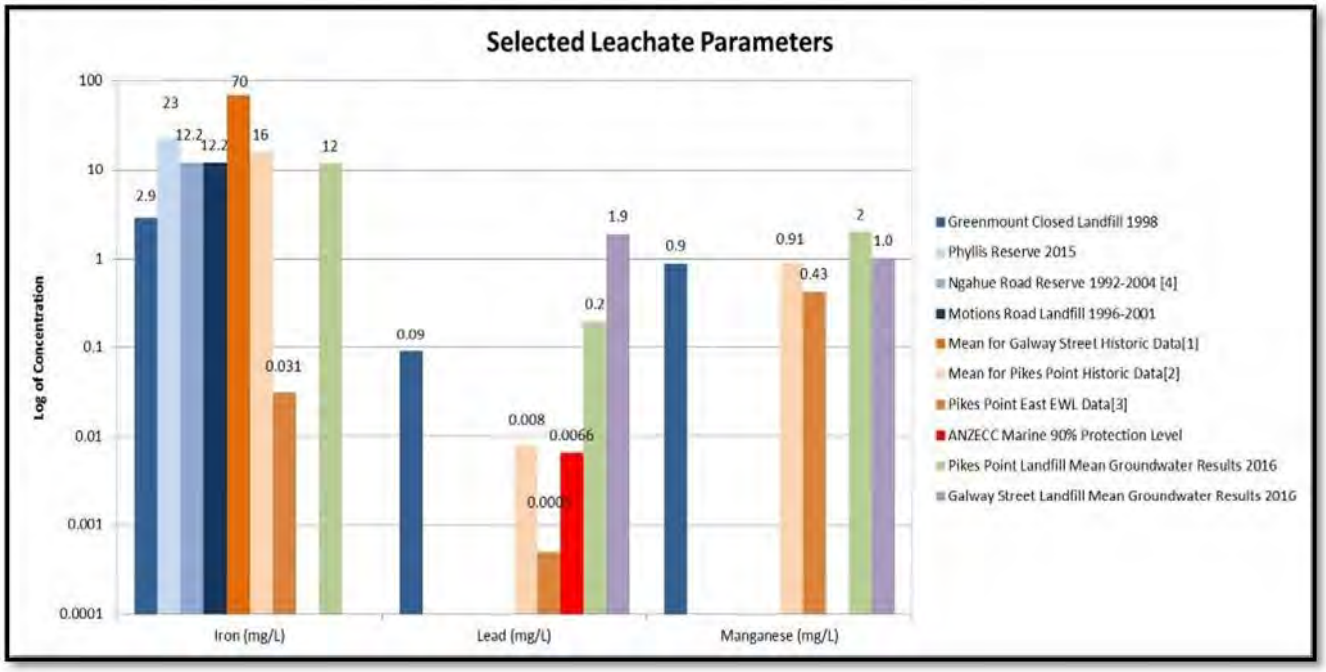


Figure 3 - Comparison of average dissolved concentrations of Iron, Lead and Manganese for EWL and Auckland City Landfills and ANZECC 90% Acceptance Criteria

Figures 1 - 3 show that average concentrations for the selected parameters, for Pikes Point and Galway Street landfill leachate, are reasonably comparable to other closed landfills within the Auckland Region. The exception to this is chloride, which historically has been significantly higher than in other closed Auckland landfills. This is inferred to be a function of sea water ingress to the landfill.

The parameters recently measured in leachate from Galway Street and Pikes Point landfill show that contaminant concentrations are generally within, or close to the ANZECC 90% protection level for marine species. This means that any diffuse discharges entering the marine receiving environment are not likely to have a significant effect on ecological receptors. The exception to this is ammoniacal nitrogen, which is generally 50 times higher than the acceptable concentrations for the 90% protection level. It should be noted that the samples are only representative of a limited number of locations within the landfill, and concentrations are likely to have high spatial variance across the landfills. Other monitoring programmes of closed landfills across the Auckland region have identified undiluted leachate ammoniacal N ranged from 30 to 3000 mg/L, compared to mean concentrations ranging 27-64 mg/L for Galway Street and the Pikes Point Landfills.

In summary, it appears that ammoniacal nitrogen is the primary risk driver for the marine receiving environment from leachate.

The contaminant of concern in the leachate is ammoniacal nitrogen. It has been compared to the concentration of ammoniacal nitrogen in the stormwater. Both samples were grab samples and cannot be assumed as representative of the overall year round concentration of ammoniacal nitrogen in the leachate or the stormwater. The maximum result of ammoniacal nitrogen in the stormwater was 35 mg/L. The maximum result of ammoniacal nitrogen in the council wells in Galway Street Landfill (BH1HB) was 88 mg/L. The maximum result of ammoniacal nitrogen in the leachate pumps from Pikes Point (Pump 2 and Pump 3) was 70 mg/L.

It is proposed that a new leachate collection system will operate under gravity and discharge leachate through the stormwater treatment wetlands. It is anticipated that the volume of the

leachate will reduce once the embankment is in place as it is likely there is a high degree of infiltration of seawater currently. If the concentration is higher and/or volume in the leachate is larger than anticipated then pre-treatment could be achieved in the road embankment prior to discharge to the stormwater treatment wetlands or the leachate will be pumped to Auckland Council's wastewater system.

1.5.2 Groundwater Quality Assessments

As part of this Project, groundwater was sampled from selected locations across and up-gradient of the EWL project area. The groundwater bores up-gradient are considered to provide a reasonable approximate 'background' groundwater quality in the area. The results from these bores have been compared to the groundwater quality in down-gradient bores at the landfills and at the foreshore which has been taken as representative of the groundwater quality discharging into the receiving environment at Mangere Inlet. Pumping tests have been undertaken at two locations in 150 mm diameter bores completed in the basalt and monitored in surrounding bores (some screened in fill and some screened in basalt) to provide an understanding of the connectivity between shallow and deep groundwater.

The results of groundwater monitoring show that concentrations of some metals and nutrient contaminants exceed the ANZECC 90% Marine Water Quality guideline in the majority of environmental and groundwater monitoring bores tested:

- The highest concentration exceeding the ANZECC criteria for cobalt was detected in groundwater monitoring well BH5004 (screened in fill) in the May monitoring round with a concentration of 0.16 mg/L.
- The highest concentration exceeding the ANZECC criteria for lead and copper was detected in council monitoring bore BH1B in the May monitoring round with concentrations of 1.9 and 0.71 mg/L.
- The highest concentration exceeding the ANZECC criteria for mercury was detected in groundwater monitoring well BH4001 (screened in basalt) in the May monitoring round with a concentration of 0.002 mg/L.
- The highest concentration exceeding the ANZECC criteria for nickel was detected in the groundwater monitoring well BH5004 (screened in fill), 0.39 mg/L and council monitoring well BH1B, 0.28 mg/L both recorded in the May monitoring round.
- The highest concentration exceeding the ANZECC criteria for zinc was detected in the groundwater monitoring well BH5004 and BH5003 (both screened in fill), 0.69 mg/L (May monitoring round) and 0.68 mg/L (July monitoring round) and council monitoring well Waikaraka West, 0.61 mg/L in the July monitoring round.
- The highest concentration exceeding the ANZECC criteria for ammonia nitrogen was detected in groundwater well BH2002 (screened in basalt) in the May monitoring round at 79 mg/L and the July monitoring round at 88 mg/L. It was also detected in the council monitoring well BH1B in the May monitoring round at 88 mg/L.

The overall trend for metals is the concentration of the contaminants is an order magnitude higher in the council wells and groundwater wells screened in the fill material than results from other lithologies. The average concentration for each individual lithology showed different metals were detected at higher concentrations in the Tuff, Waitemata and Tauranga formations. However there are a limited number of wells in these lithologies and difficult to draw any conclusions from the results. The overall trend from the results for Ammonia Nitrogen is higher concentrations were detected on average in the council wells and groundwater wells screened in fill than the other wells.

Organics have not been measured above laboratory detection limits at any location, for any of the monitoring events.

The primary contaminants identified during groundwater investigations were nutrients, in particular

ammoniacal Nitrogen. Other contaminants included low concentrations of some metals.

The groundwater samples collected from the monitoring well transects[8] did not demonstrate any discernible trends between monitoring rounds. However there were two pronounced trends from the two monitoring rounds across the project area. The first trend was the increase of ammoniacal nitrogen in groundwater from the wells across the landfill footprint up-gradient to the coast.

The second trend was the measurement of high conductivity, sodium and chloride in wells closer to the shoreline, and adjacent to Miami Stream, with signatures also notable in bores along Nielson Street, west of Waikaraka Park. This is likely indicative of sea water ingress into the groundwater system. Maps attached in Appendix B1 show the concentrations of ammoniacal nitrogen, chloride and sodium and provides an indication of the inferred saline ingress.

For example, BH4009 (screened 6 m to 9 m bgl in basalt), located on the eastern side of Miami Stream within Pikes Point East Landfill, approximately 200 m inland yielded elevated (15,000 mg/L) Total Dissolved Solids (TDS), yet low ammoniacal N. This indicates direct connection with seawater at this location. The high TDS is likely to be indicative of sea water intrusion, and the low ammoniacal N suggests regular flushing maybe causing dilution or flushing of contaminants.

TDS in landfills comprises inorganic salts and dissolved organics, and therefore elevated TDS is also associated with typical landfill degradation processes. The observation noted for BH4009, is not consistent with samples collected from other boreholes located near the foreshore (such as BH5001, BH5004, BH2033 and BH5007), in which the TDS results appear to be more consistent with aged degradation leachate profiles (ie. TDS <1000 mg/L), with ammoniacal N concentrations still notable. The main area indicating seawater intrusion is between Galway Street and Victoria Street, inland as far as Neilson Street. This may be a result of the more permeable nature of the embankment on the seaward side of the closed Galway Street Landfill (without a clay core), and pumping of water for public water supply upgradient at Pearce and Rowe Streets.

1.5.3 Stiff Diagrams

Stiff diagrams were prepared using the cation/anion analytical data collected from the groundwater bores, leachate pumping wells and stormwater catchment outfalls. Stiff diagrams demonstrate relative ion concentrations for each sample location (Z-EF-031 – Appendix B1). The diagrams have been used to differentiate sources of waters and to identify likely groundwater flow paths.

Sampling locations indicating leachate and saline intrusion indicators are given in Table 3.

Table 3 – Sampling Sites with Leachate and Saline Intrusion Indicators

Groundwater Bores and Leachate Pumping	Screened Geological Unit	Leachate Indicators	Saline Intrusion Indicators
Pump 1	N/A	✓	
Pump 2	N/A	✓	
Pump 3	N/A	✓	
Pump 4	N/A	✓	
BH2002	Basalt	✓	
BH4001	Basalt	✓	
BH2032	Fill	✓	

[8] Transects ran parallel with Victoria Street, Captain Springs Road, and the proposed Ports of Auckland access road.

BH4003A	Basalt	✓	
BH4011	Tuff	✓	
BH5001	Fill	✓	
BH5005	Basalt	✓	✓
BH2001	Basalt		✓
BH2004	Basalt		✓
BH4004A	Basalt		✓
BH4009	Basalt		✓
BH5002	Basalt		✓

1.6 Results Summary

In summary, the following conclusions can be drawn from the groundwater quality investigations:

- The results of groundwater monitoring show that concentrations of cobalt, copper, lead, mercury, nickel, zinc and ammoniacal nitrogen exceed the ANZECC 90% Marine Water Quality guideline in the majority of environmental and groundwater monitoring bores tested.
- Concentrations of ammoniacal nitrogen in the leachate pump stations are generally 50 times higher than the acceptable concentrations for marine water at the 90% protection level. It should be noted that the samples are only representative of a limited number of locations within the landfill, and concentrations are likely to have high spatial variance across the landfills.
- Some of the groundwater samples collected from monitoring wells within the landfill had a signature of leachate.
- Contaminant concentrations were most elevated in groundwater samples around the Galway landfill.
- Saline ingress is apparent in particular in basalt monitoring wells between Galway Street and Victoria Street north to Neilson Street, as indicated by the conductivity, balance of chloride and sodium analytes and monitoring of groundwater level variation (tidal fluctuation refer to the Technical Report 13 – Groundwater Assessment).

HE Wright

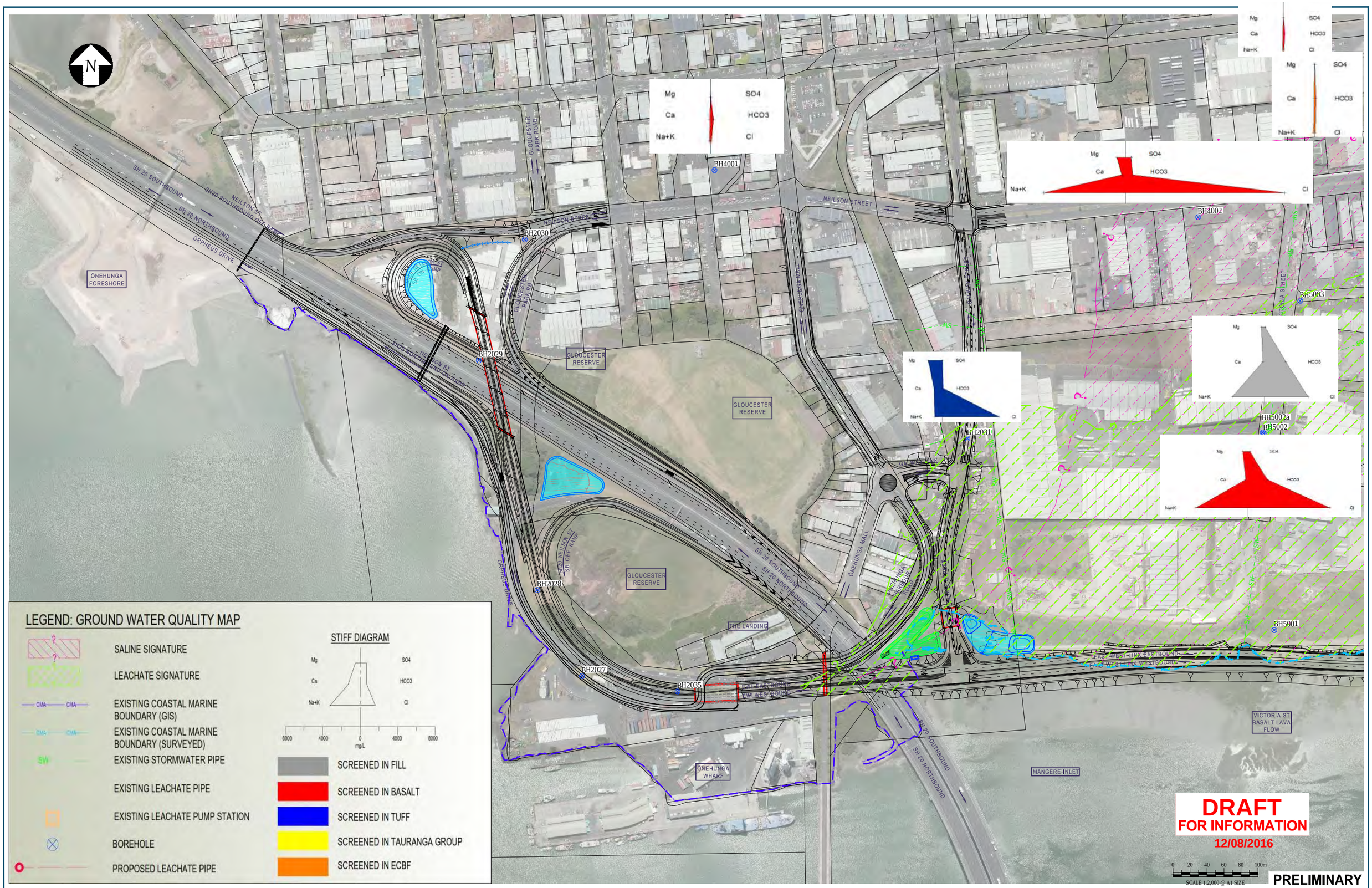
Hannah Wright

Senior Environmental Scientist

Wijnand Udema

Contaminated Land Lead

Appendix B1 – Map showing the stiff diagrams demonstrating leachate and tidal signatures



LEGEND: GROUND WATER QUALITY MAP

- SALINE SIGNATURE
- LEACHATE SIGNATURE
- EXISTING COASTAL MARINE BOUNDARY (GIS)
- EXISTING COASTAL MARINE BOUNDARY (SURVEYED)
- EXISTING STORMWATER PIPE
- EXISTING LEACHATE PIPE
- EXISTING LEACHATE PUMP STATION
- BOREHOLE
- PROPOSED LEACHATE PIPE

STIFF DIAGRAM

Mg, Ca, Na+K, SO4, HCO3, Cl

8000 4000 0 4000 8000 mg/L

- SCREENED IN FILL
- SCREENED IN BASALT
- SCREENED IN TUFF
- SCREENED IN TAURANGA GROUP
- SCREENED IN ECBF

No.	Issued Status	Drawn	Check'd	App'd	Date
A	ISSUED FOR INFORMATION ONLY	AR			

DISCLAIMER

The information shown on this drawing is solely for the purpose of supporting application under the RMA for resource consents and/ or designations.
All information shown is subject to final design and review for compliance with any approved consents and/ or designations.
This Drawing must not be used for construction.

NZ TRANSPORT AGENCY WAKA KOTAHI

East West Link

Drawn	Drafting Check	Reviewed Design Manager	Approved Alliance Manager
A RAM			
Designed	Design Check		

Scale: Original Scale (A1) | Reduced Scale (A3) AS SHOWN | Contract No PA4041

Drawing Title: GEOTECHNICAL
GROUND WATER QUALITY MAP
NELSON ST INTERCHANGE - SHEET 1

Drawing Number: Z-EF-031 | Rev No. A

Plot Date: 12 August 2016 - 5:57 PM | Plotted by: Dinesh Chelatti | Cad File No: W:\CAD\AutoCAD\DWGs\Z-EF-031-036.dwg

DRAFT
FOR INFORMATION
12/08/2016

PRELIMINARY

No.	Issued Status	Drawn	Check'd	App'd	Date
A	ISSUED FOR INFORMATION ONLY	AR			

DISCLAIMER
The information shown on this drawing is solely for the purpose of supporting application under the RMA for resource consents and/ or designations.
All information shown is subject to final design and review for compliance with any approved consents and/ or designations.
This Drawing must not be used for construction.

NZ TRANSPORT AGENCY WAKA KOTAHI
East West Link

Drawn: A RAM	Drafting Check	Reviewed: Design Manager	Approved: Alliance Manager
Designed	Design Check		
Scale: Original Scale (A1)	Reduced Scale (A3)	AS SHOWN	Contract No: PA4041

Drawing Title: GEOTECHNICAL
GROUND WATER QUALITY MAP
EMBANKMENT - SHEET 2

Drawing Number: Z-EF-032
Rev No.: A

Plot Date: 12 August 2016 - 5:57 PM
Plotted by: Dinesh Chelani
Cad File No: W:\CAD\AutoCAD\DWGs\Z-EF-031-036.dwg

DRAFT
FOR INFORMATION
12/08/2016

PRELIMINARY

No.	Issued Status	Drawn	Check'd	App'd	Date
A	ISSUED FOR INFORMATION ONLY	AR			

DISCLAIMER
The information shown on this drawing is solely for the purpose of supporting application under the RMA for resource consents and/ or designations.
All information shown is subject to final design and review for compliance with any approved consents and/ or designations.
This Drawing must not be used for construction.

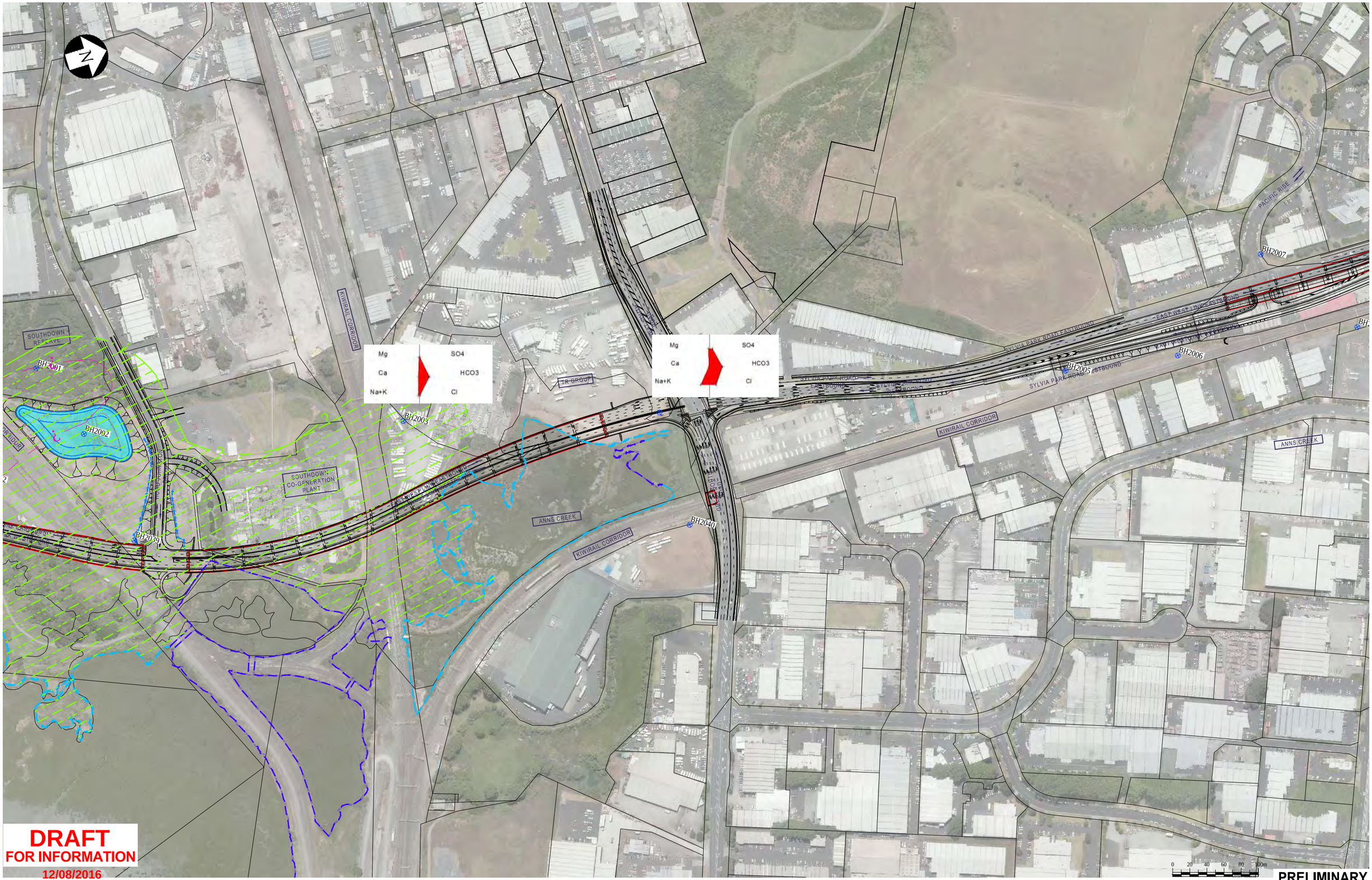
NZ TRANSPORT AGENCY WAKA KOTAHI
East West Link

Drawn: A RAM	Drafting Check	Reviewed: Design Manager	Approved: Alliance Manager
Designed	Design Check		
Scale: Original Scale (A1)	Reduced Scale (A3): AS SHOWN	Contract No: PA4041	

Drawing Title: GEOTECHNICAL
GROUND WATER QUALITY MAP
EMBANKMENT/ ANNS CREEK - SHEET 3

Drawing Number: Z-EF-033
Rev No.: A

Plot Date: 12 August 2016 - 5:57 PM Plotted by: Dinesh Chelatti Cad File No: W:\CAD\AutoCAD\DWGs\Z-EF-031-036.dwg



DRAFT
FOR INFORMATION
12/08/2016

PRELIMINARY

No.	Issued Status	Drawn	Check'd	App'd	Date
A	ISSUED FOR INFORMATION ONLY	AR			

DISCLAIMER
The information shown on this drawing is solely for the purpose of supporting application under the RMA for resource consents and/ or designations.
All information shown is subject to final design and review for compliance with any approved consents and/ or designations.
This Drawing must not be used for construction.

NZ TRANSPORT AGENCY WAKA KOTAHI
East West Link

Drawn	Drafting Check	Reviewed Design Manager	Approved Alliance Manager
A RAM			
Designed	Design Check		

Scale: Original Scale (A1) Reduced Scale (A3) AS SHOWN
Contract No PA4041

Drawing Title: GEOTECHNICAL
GROUND WATER QUALITY MAP
ANNS CREEK/SYLVIA PARK ROAD

Drawing Number: Z-EF-034
Rev No. A

Plot Date: 12 August 2016 - 5:58 PM Plotted by: Dinesh Chelanti Cad File No: W:\CAD\AutoCAD\DWGs\Z-EF-031-036.dwg

DRAFT
FOR INFORMATION
12/08/2016

SCALE 1:2,000 @ A1 SIZE

PRELIMINARY

No.	Issued Status	Drawn	Check'd	App'd	Date
A	ISSUED FOR INFORMATION ONLY	AR			

DISCLAIMER
The information shown on this drawing is solely for the purpose of supporting application under the RMA for resource consents and/ or designations.
All information shown is subject to final design and review for compliance with any approved consents and/ or designations.
This Drawing must not be used for construction.

NZ TRANSPORT AGENCY WAKA KOTAHI

East West Link

Drawn	Drafting Check	Reviewed Design Manager	Approved Alliance Manager
A RAM			
Designed	Design Check		

Scale: Original Scale (A1) | Reduced Scale (A3) AS SHOWN

Contract No PA4041

Drawing Title: GEOTECHNICAL
GROUND WATER QUALITY MAP
SH1/SYLVIA PARK RAMPS - SHEET 5

Drawing Number: Z-EF-035

Rev No. A

Plot Date: 12 August 2016 - 5:58 PM Plotted by: Dinesh Chelaml Cad File No: W:\CAD\AutoCAD\DWGs\Z-EF-031-036.dwg

DRAFT
FOR INFORMATION
12/08/2016

SCALE 1:2,000 @ A1 SIZE

PRELIMINARY

No.	Issued Status	Drawn	Check'd	App'd	Date
A	ISSUED FOR INFORMATION ONLY	AR			

DISCLAIMER
The information shown on this drawing is solely for the purpose of supporting application under the RMA for resource consents and/ or designations.
All information shown is subject to final design and review for compliance with any approved consents and/ or designations.
This Drawing must not be used for construction.

NZ TRANSPORT AGENCY WAKA KOTAHI

East West Link

Drawn: A RAM	Drafting Check	Reviewed: Design Manager	Approved: Alliance Manager
Designed	Design Check		

Scale: Original Scale (A1) | Reduced Scale (A3): AS SHOWN

Contract No: PA4041

Drawing Title: GEOTECHNICAL
GROUND WATER QUALITY MAP
SH1/ PRINCES ST INTERCHANGE - SHEET 6

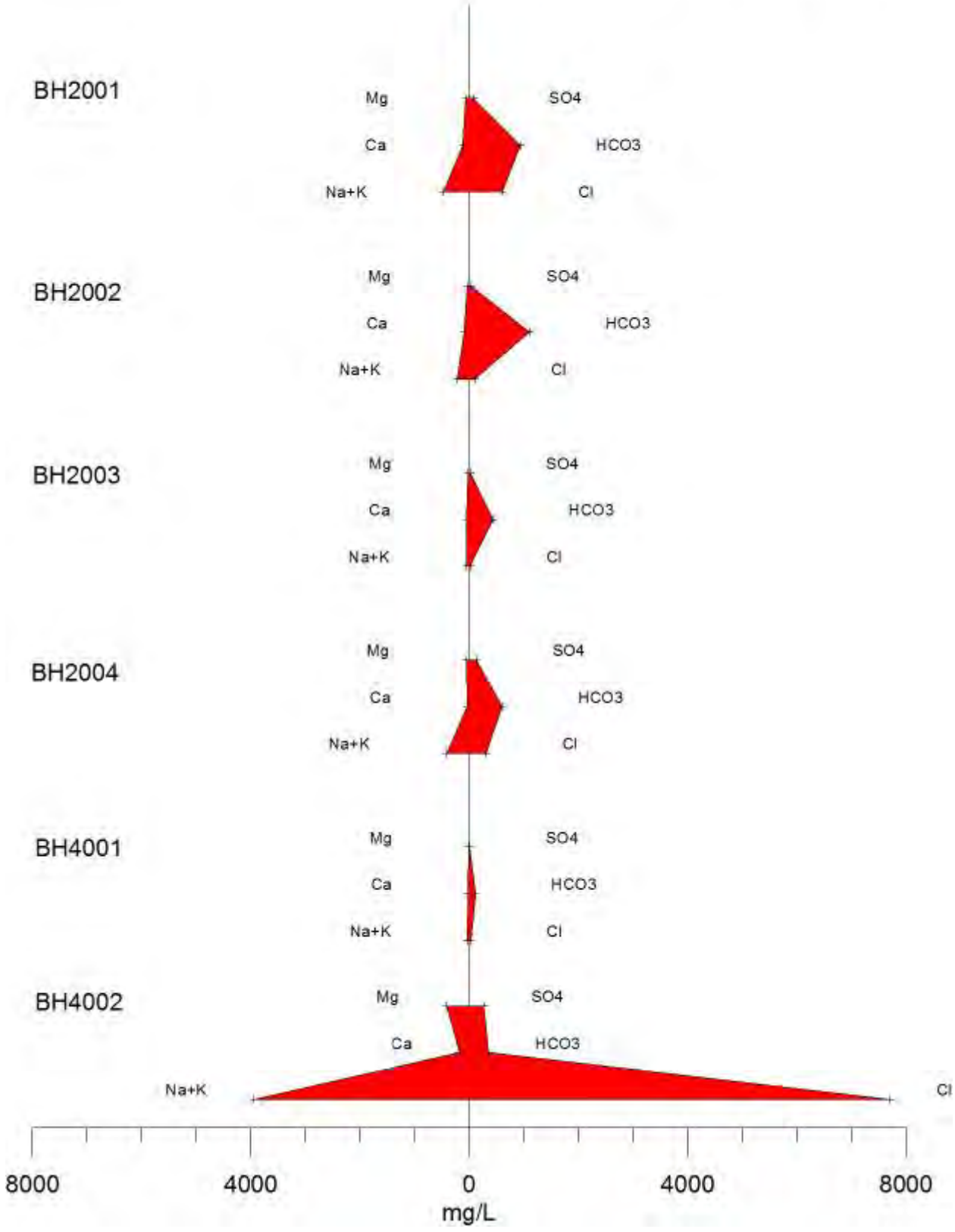
Drawing Number: Z-EF-036

Rev No.: A

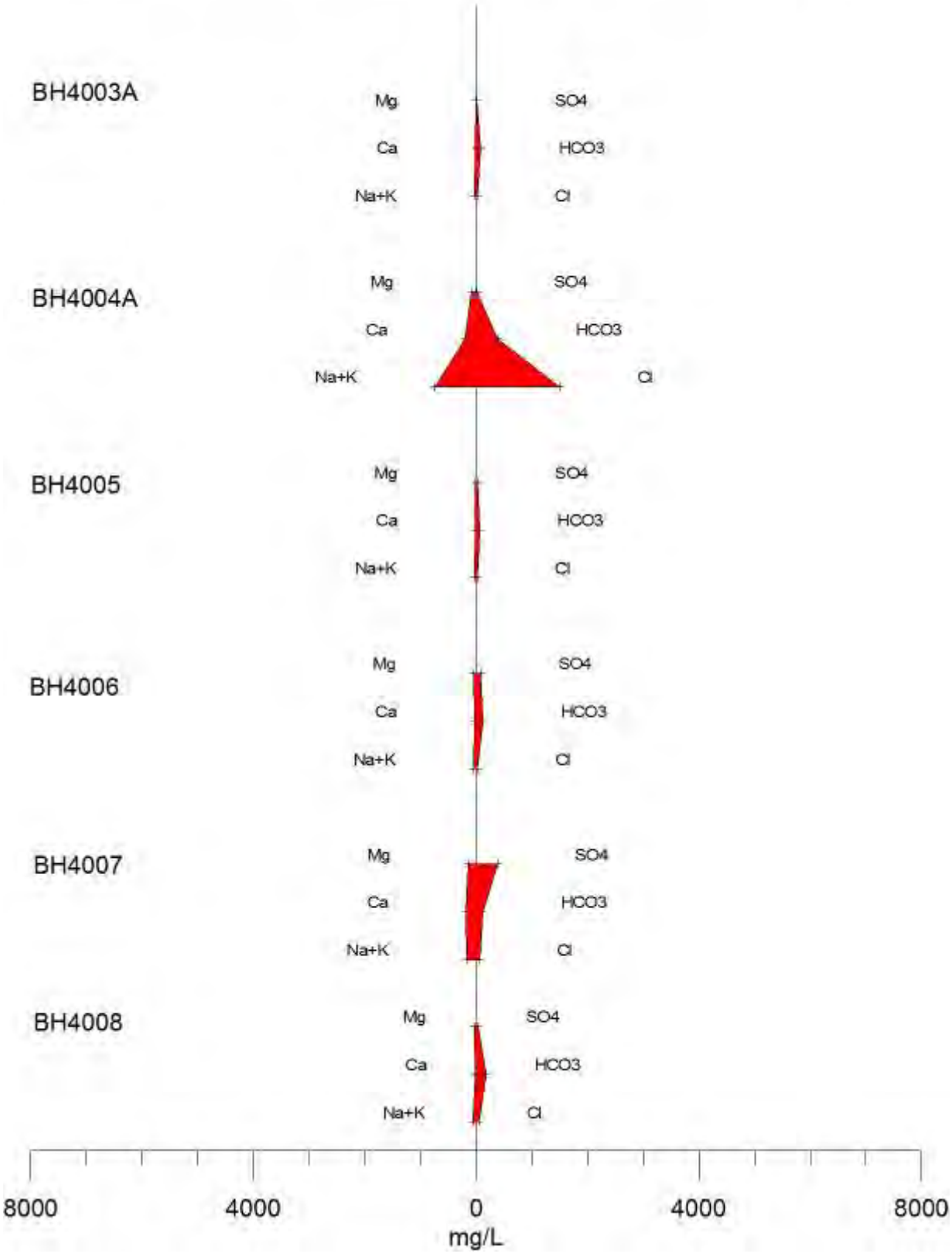
Plot Date: 12 August 2016 - 5:58 PM Plotted by: Dinesh Chelani Cad File No: W:\CAD\AutoCAD\DWGs\Z-EF-031-036.dwg

Appendix B2 – Stiff Plots

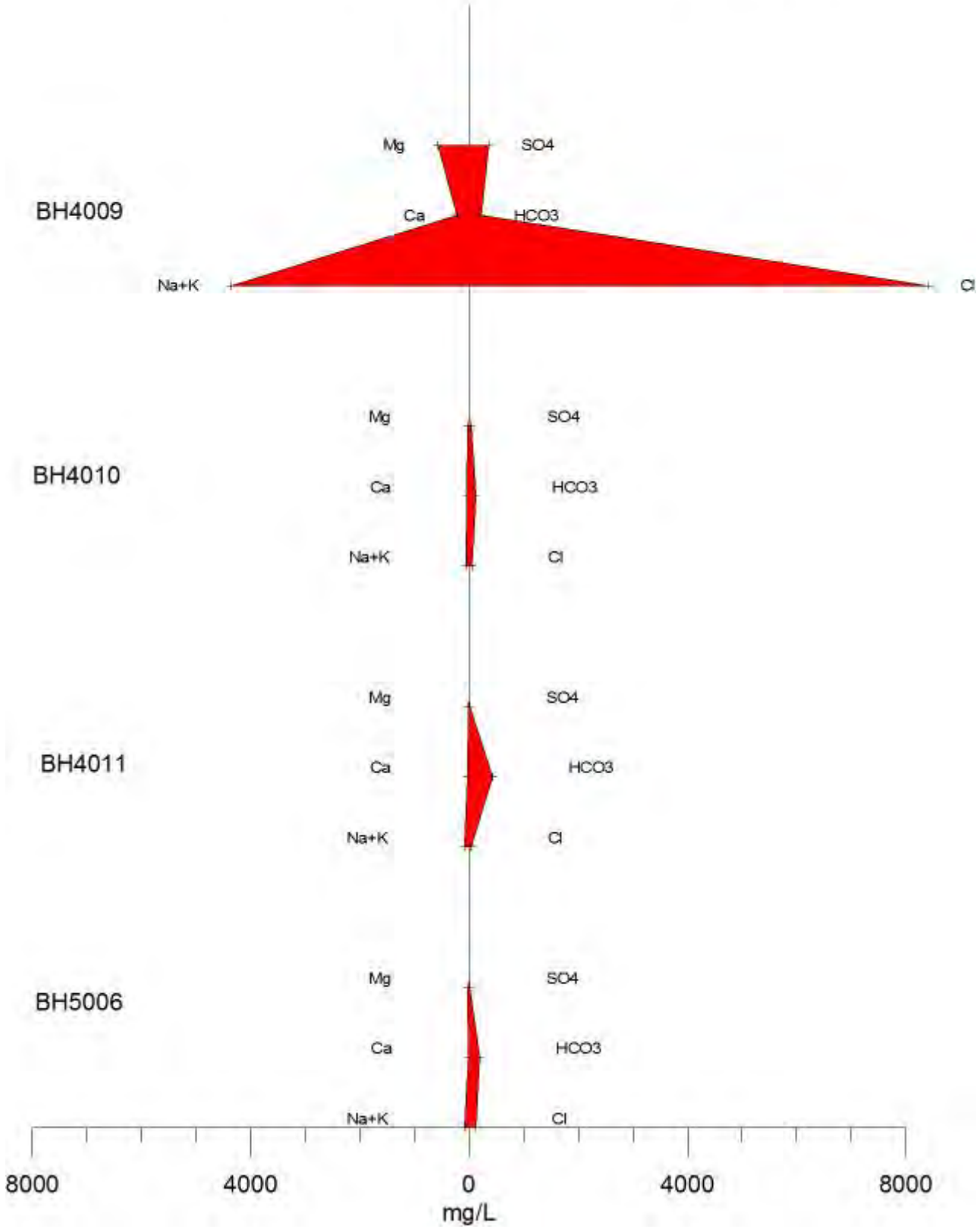
Groundwater Wells Screened in Basalt (page 1)



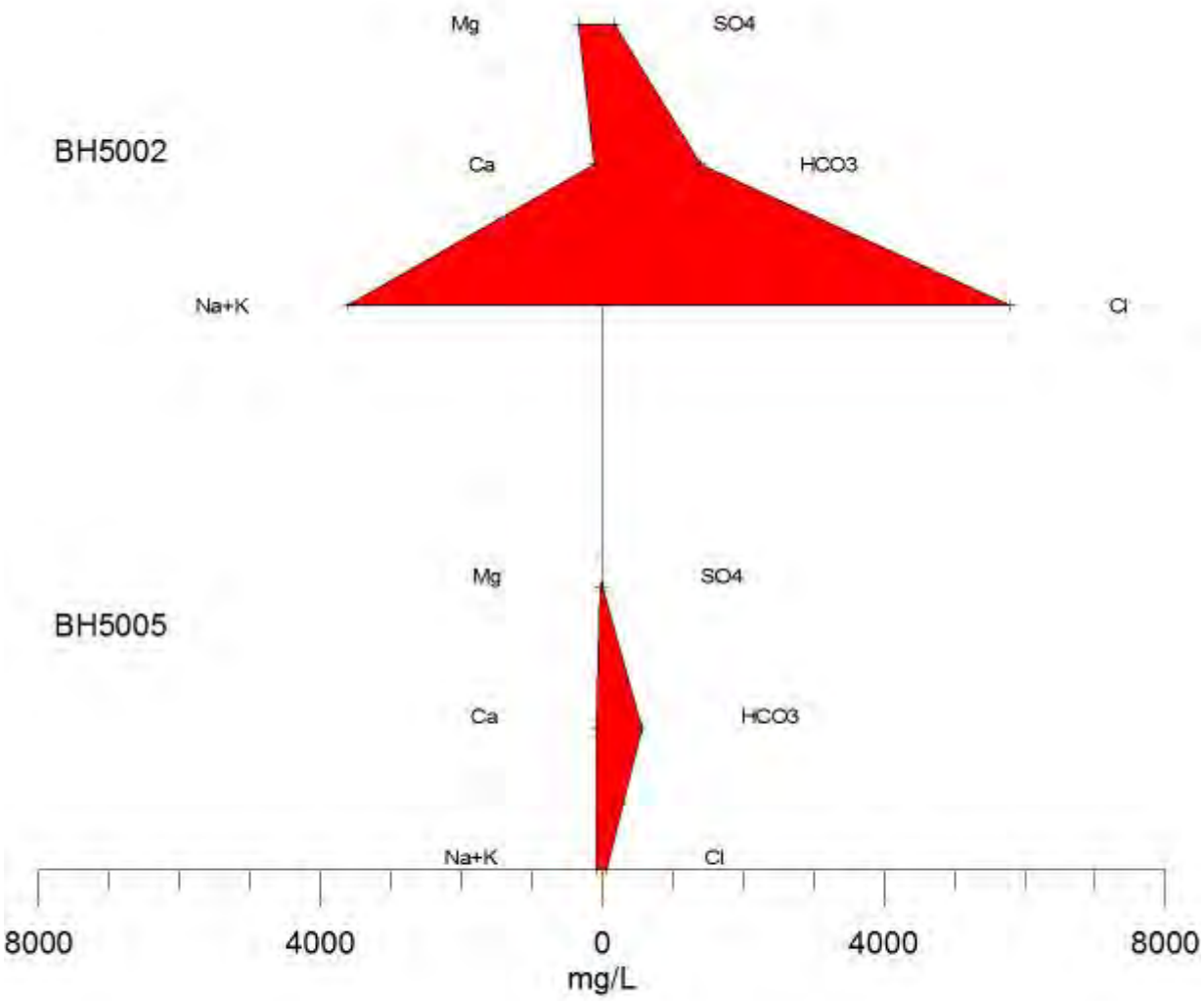
Groundwater Wells Screened in Basalt (page 2)



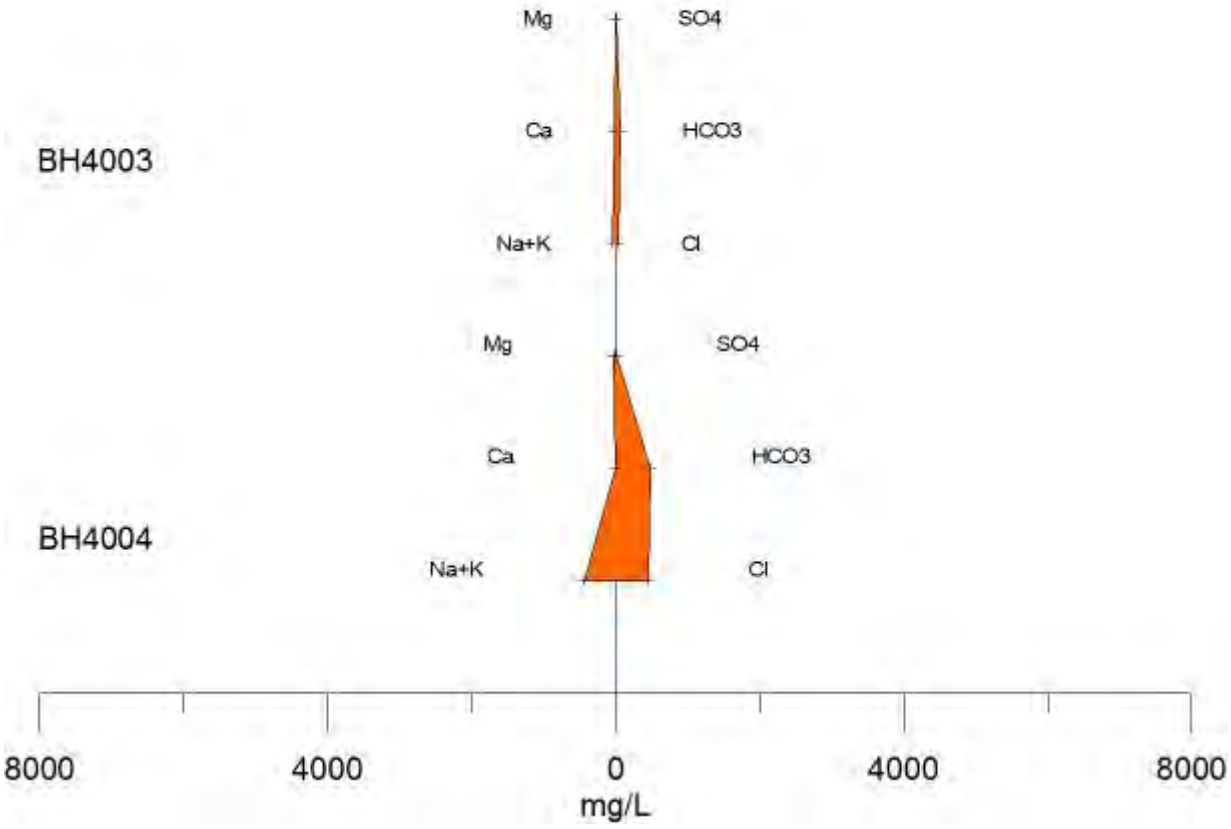
Groundwater Wells Screened in Basalt (page 3)



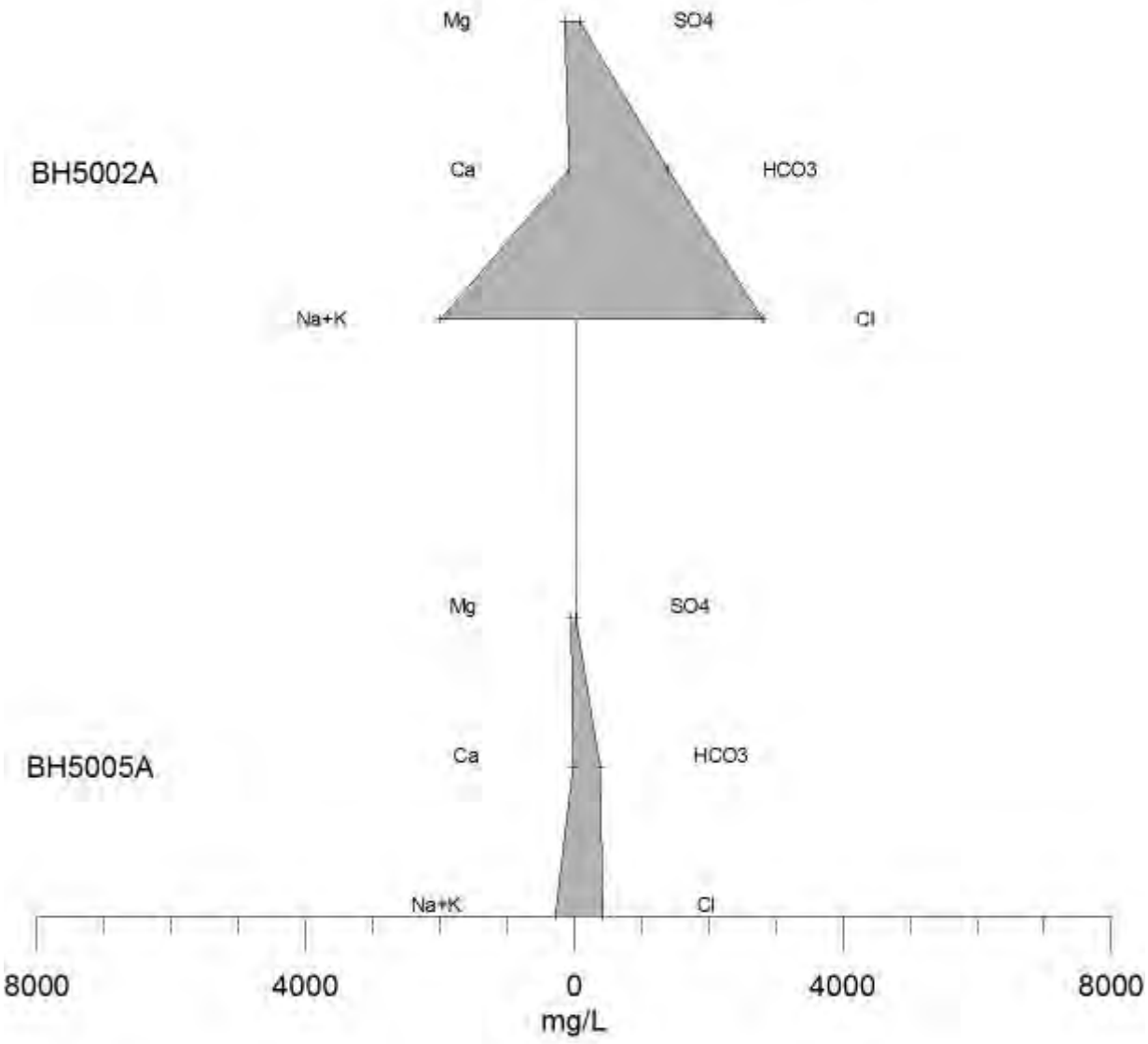
Groundwater Wells Screened in Basalt (page 4)



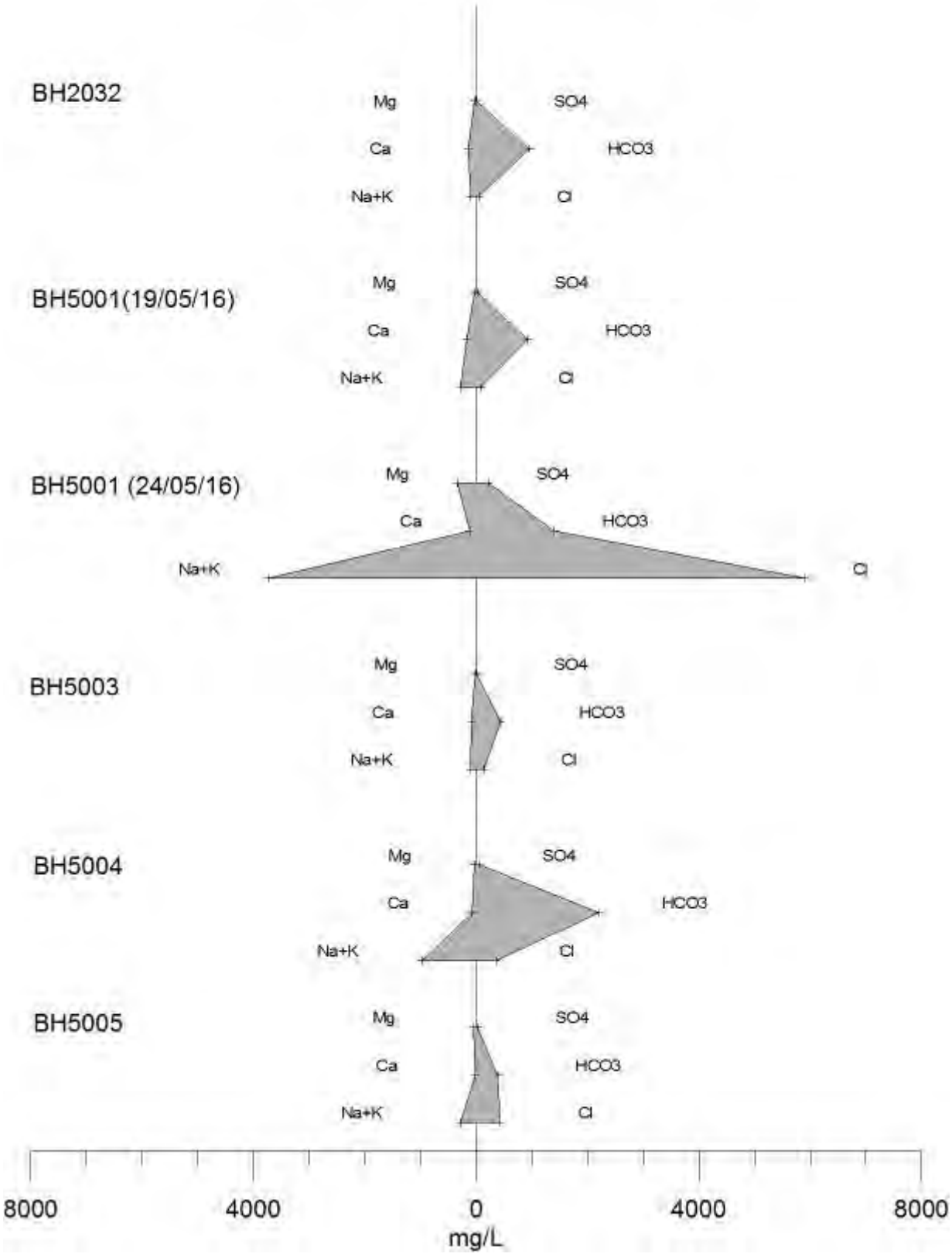
Groundwater Wells Screened in ECBF (Sand/Silt)



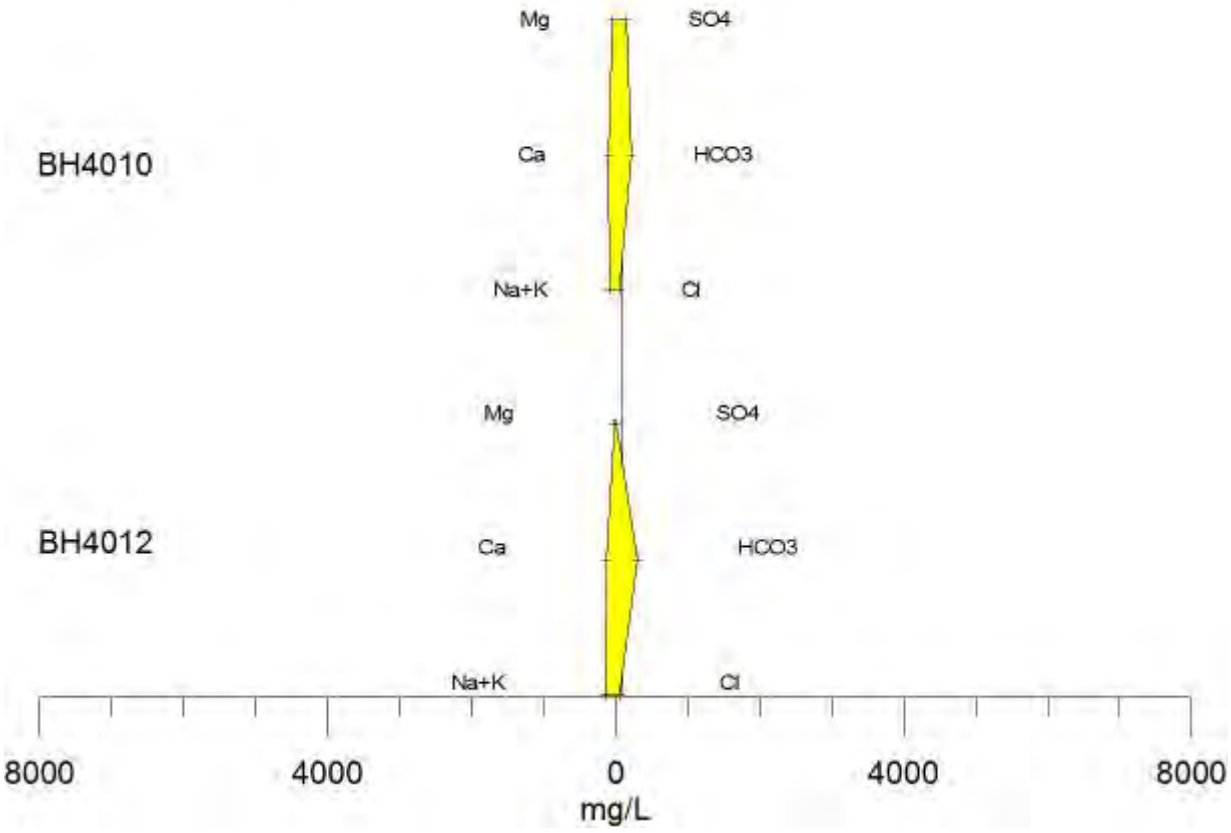
Groundwater Wells Screened in Fill



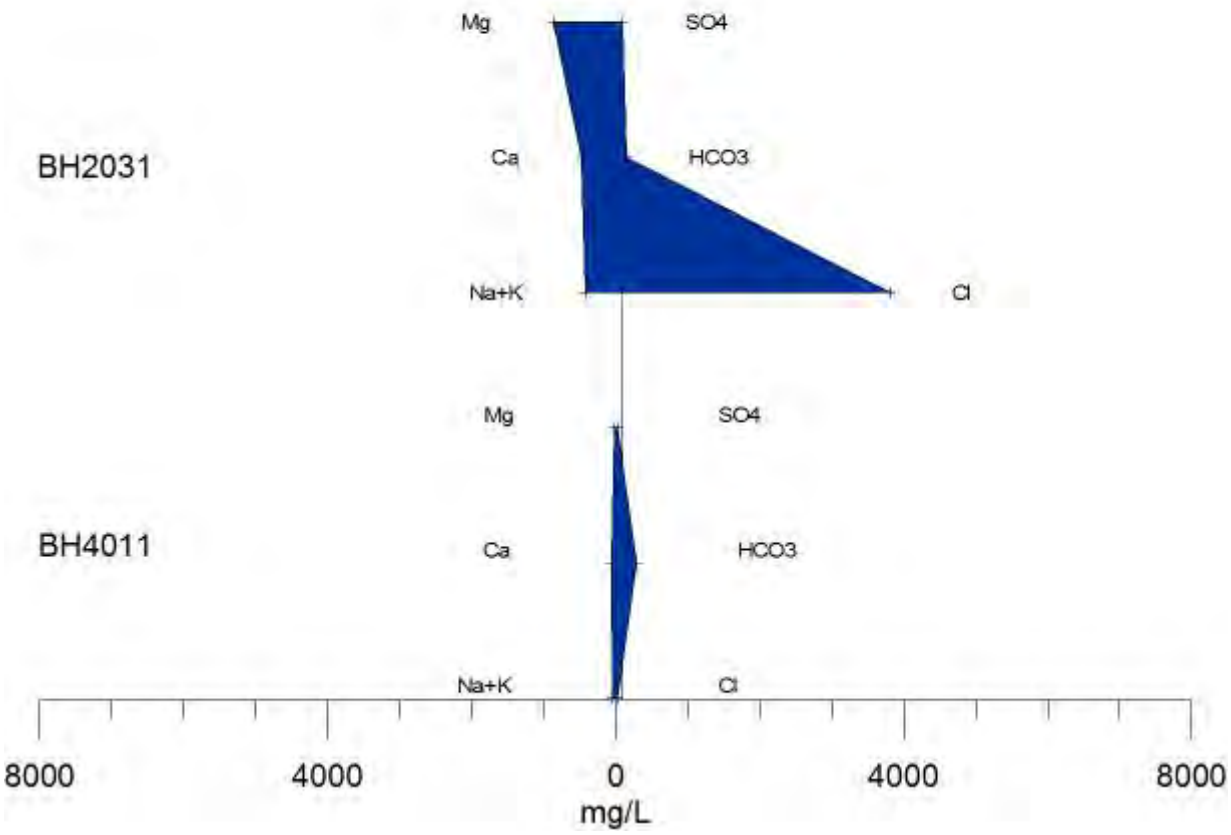
Groundwater Wells Screened in Fill



Groundwater Wells Screened in TGA (Sandy Silt)



Groundwater Wells Screened in Tuff



Appendix B3 - Analytical result tables

Appendix B3
Table 4
Analytical Results of the Groundwater

					Location Code	BH2001	BH2002	BH2002	BH2003	BH2004	BH2005	BH2011	BH2023	BH2031	BH2031	BH2032	BH2032	BH2033	BH4001	BH4002	BH4002	BH4003A
					Sampled Date	24/05/2016	24/05/2016	12/07/2016	24/05/2016	24/05/2016	7/07/2016	7/07/2016	11/07/2016	24/05/2016	11/07/2016	18/05/2016	6/07/2016	7/07/2016	20/05/2016	24/05/2016	11/07/2016	24/05/2016
					Field ID	EWL-BH2001	EWL-BH2002	BH2002	EWL-BH2003	EWL-BH2004	BH2005	BH2011	BH2023	EWL-BH2031	BH2031	BH2032	BH2032	BH2033	BH4001	EWL-BH4002	BH4002	EWL-BH4003A
					Screen Geology	Basalt	Basalt	Basalt	Basalt	Basalt	Basalt	Basalt	Basalt	Tuff	Tuff	Fill	Fill	Basalt	Basalt	Basalt	Basalt	Basalt
Chemical Group	**Chem Name**	**Units**	**EQL**	ANZECC 2000 MW 90%																		
Field	ORP	mV			-146.5	-	-38.3	-60.1	-65.8	-13.5	-17.2	-41.2	82	-	-84.3	-34.6	-1.5	102.2	-92.7	-54.2	46.3
	SP Conductivity	µS/cm			2322	-	2171	698	2321	474.8	567.2	2378	8466	-	1572	1531	441.6	291.9	21,230	23,740	339
	Dissolved Oxygen (Field) %	%			-	-	20.7	-	-	47.4	35.4	31.8	-	-	-	31.5	37.6	-	-	34.1	-
	Dissolved Oxygen (Field) % (Filtered)	%			1.5	-	-	8	11.7	-	-	-	17.3	-	12.1	-	-	40.6	12.1	-	57.2
	Dissolved Oxygen (Field)	mg/L			-	-	1.95	-	-	4.48	3.4	3	-	-	-	2.92	3.53	-	-	2.98	-
	Dissolved Oxygen (Field) (Filtered)	mg/L			0.13	-	-	0.77	1.13	-	-	-	1.59	-	1.11	-	-	3.6	1.04	-	5.51
	Temp (Field)	oC			20.8	-	18.5	18.2	16.3	17.8	17.1	17.3	17.8	-	18.5	17.5	17.6	18.5	18.8	17.9	17.1
	pH (Field)	pH_Units			7.41	-	6.92	6.44	6.91	6.8	6.78	7.02	6.83	-	6.49	6.52	7.04	7.84	7.09	7.11	8.9
	Electrical Conductivity (Field)	uS/cm			2146	-	1902	606	1936	409.1	481.5	2025	7301	-	1375	1311	379.4	252.6	18,700	20,520	287.7
Metals	Aluminium (Filtered)	mg/L	0.05		-	-	<0.05	-	-	0.12	<0.05	4.4	-	0.24	-	0.31	2	-	-	<0.05	-
	Antimony (Filtered)	mg/L	0.005		-	-	<0.005	-	-	<0.005	<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	-	<0.005	-
	Arsenic	mg/L	0.001		-	-	-	-	-	-	-	-	-	-	0.009	-	-	0.003	-	-	-
	Arsenic (Filtered)	mg/L	0.001		0.002	0.003	0.002	0.003	<0.001	0.001	<0.001	0.005	<0.01	0.004	-	0.07	0.003	-	<0.01	<0.001	0.002
	Barium (Filtered)	mg/L	0.02		-	-	0.08	-	-	0.03	0.03	0.24	-	0.75	-	0.46	0.16	-	-	0.07	-
	Beryllium	mg/L	0.001		-	-	-	-	-	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-
	Beryllium (Filtered)	mg/L	0.001		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Boron	mg/L	0.05		-	-	-	-	-	-	-	-	-	-	1.9	-	-	<0.05	-	-	-
	Boron (Filtered)	mg/L	0.05		-	-	5.6	-	-	<0.05	0.12	1.4	-	<0.05	-	1.7	<0.05	-	-	1.8	-
	Cadmium	mg/L	0.0002	0.014	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	<0.0002	-	-	-
	Cadmium (Filtered)	mg/L	0.0002	0.014	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.002	0.0004	-	<0.0002	<0.0002	-	<0.002	<0.0002	<0.0002
	Chromium (hexavalent)	mg/L	0.001	0.02	-	-	-	-	-	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-
	Chromium (III+VI) (Filtered)	mg/L	0.001	0.02	<0.001	<0.001	<0.001	0.003	<0.001	<0.001	<0.001	0.005	<0.01	<0.001	-	0.002	0.004	-	<0.01	<0.001	0.002
	Cobalt	mg/L	0.001	0.014	-	-	-	-	-	-	-	-	-	-	0.003	-	-	0.016	-	-	-
	Cobalt (Filtered)	mg/L	0.001	0.014	-	-	0.003	-	-	<0.001	<0.001	0.023	-	0.002	-	0.001	0.008	-	-	<0.001	-
	Copper	mg/L	0.001	0.003	-	-	-	-	-	-	-	-	-	-	0.067	-	-	0.021	-	-	-
	Copper (Filtered)	mg/L	0.001	0.003	<0.001	0.003	<0.001	0.002	<0.001	0.002	<0.001	0.027	0.012	0.002	-	<0.001	0.016	-	<0.01	<0.001	0.021
	Iron (Filtered)	mg/L	0.05		-	-	-	-	-	6.1	7.4	22	-	33	-	28	11	-	-	9.8	-
	Lead	mg/L	0.001	0.0066	-	-	-	-	-	-	-	-	-	-	0.017	-	-	0.003	-	-	-
	Lead (Filtered)	mg/L	0.001	0.0066	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.006	0.015	0.007	-	<0.001	0.006	-	<0.01	<0.001	0.014
	Lithium (Filtered)	mg/L	0.005		-	-	0.009	-	-	0.0022	0.0024	0.01	-	0.005	-	0.014	0.0084	-	-	0.036	-
	Manganese	mg/L	0.005		-	-	-	-	-	-	-	-	-	-	0.95	-	-	0.34	-	-	-
	Manganese (Filtered)	mg/L	0.005		-	-	0.54	-	-	0.52	0.52	2.4	-	0.88	-	1	1.1	-	-	0.7	-
	Mercury	mg/L	0.0001	0.0007	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	0.002	-	-	-
	Mercury (Filtered)	mg/L	0.0001	0.0007	<0.0001	<0.0001	-	<0.0001	<0.0001	-	-	-	<0.001	-	-	-	-	-	<0.001	-	<0.0001
	Molybdenum (Filtered)	mg/L	0.005		-	-	<0.005	-	-	<0.005	<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	-	<0.005	-
	Nickel	mg/L	0.001	0.2	-	-	-	-	-	-	-	-	-	-	0.018	-	-	0.019	-	-	-
	Nickel (Filtered)	mg/L	0.001	0.2	0.005	0.014	0.003	0.03	0.002	<0.001	<0.001	0.014	<0.01	0.002	-	0.004	0.013	-	<0.01	<0.001	0.003
	Selenium	mg/L	0.001		-	-	-	-	-	-	-	-	-	-	<0.001	-	-	0.001	-	-	-
	Selenium (Filtered)	mg/L	0.001		-	-	<0.001	-	-	<0.001	<0.001	<0.001	-	<0.001	-	<0.001	<0.001	-	-	<0.001	-
	Silver (Filtered)	mg/L	0.005	0.0018	-	-	<0.005	-	-	<0.005	<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	-	<0.005	-
	Strontium (Filtered)	mg/L	0.005		-	-	1	-	-	-	-	0.61	-	3.6	-	1.1	-	-	-	2.9	-
	Thallium (Filtered)	mg/L	0.001		-	-	<0.001	-	-	<0.001	<0.001	<0.001	-	<0.001	-	<0.001	<0.001	-	-	<0.001	-
	Tin (Filtered)	mg/L	0.005		-	-	<0.005	-	-	<0.005	<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	-	<0.005	-
	Uranium (Filtered)	mg/L	0.005		-	-	<0.005	-	-	<0.005	<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	-	<0.005	-
	Vanadium (Filtered)	mg/L	0.005	0.16	-	-	<0.005	-	-	<0.005	<0.005	0.016	-	<0.005	-	<0.005	0.011	-	-	<0.005	-
	Zinc	mg/L	0.005	0.023	-	-	-	-	-	-	-	-	-	-	0.07	-	-	0.041	-	-	-
	Zinc (Filtered)	mg/L	0.001	0.023	0.009	0.019	0.005	0.03	0.078	0.006	0.003	0.13	0.13	0.4	-	0.009	0.058	-	0.08	0.003	0.16
TPH	C7-C9	mg/L	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	<0.1
	C10 - C14	mg/L	0.05		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.05	<0.2	<0.2	<0.05	<0.2	<0.2	<0.2
	C15-C36	mg/L	0.4		<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	-	<0.4	<0.4	-	<0.4	<0.4	<0.4
	C7-C36	mg/L	0.7		<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	-	<0.7	<0.7	-	<0.7	<0.7	<0.7
BTEX & MAH	Benzene	mg/L	0.001	0.9	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	BTEX (Sum of Total) - Calc	µg/L			<6	<6	<6	<6	<6	<6	<6	16.5	<6	<6	<6	<6	<6	<6	<6	<6	<6
	Ethylbenzene	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Toluene	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.008	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Xylene (o)	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Xylene (m & p)	mg/L	0.002		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
	Xylene Total	µg/L	3		<3	<3	<3	<3	<3	<3	<3	6	<3	<3	<3	<3	<3	<3	<3	<3	<3
	Xylenes (Sum of Total) - Calc	µg/L			<1	<1	<1	<1	<1	<1	<1	2	<1	<1	<1	<1	<1	<1	<1	<1	<1
PAH	PAHs (Sum of Total) - Calc	µg/L			<21	<21	-	<21	<21	-	<21	-	<21	-	<21	-	-	<21	<21	<21	<21
	Benzo[b+j]fluoranthene	mg/L	0.001		<0.001	<0.001	-	<0.001	<0.001	-	<0.001	-	<0.001	-	<0.001	-	-	<0.001	<0.001	<0.001	<0.001
	Pyrene	mg/L	0.001		<0.001	<0.001	-	<0.001	<0.001	-	<0.001	-	<0.001	-	<0.001	-	-	<0.001	<0.001	<0.001	<0.001
	Carcinogenic PAHs (as B(a)P TEQ) - Calc	µg/L			<2.42	<2.42	-	<2.42	<2.42	-	<2.42	-	<2.42	-	<2.42	-	-	<2.42	<2.42	<2.42	<2.42
	Acenaphthene	mg/L	0.001		<0.001	<0.001	-	<0.001	<0.001	-	<0.001	-	<0.001	-	<0.001	-	-	<0.001	<0.001	<0.001	<0.001
	Acenaphthylene	mg/L	0.001		<0.001	<0.001	-	<0.001	<0.001	-	<0.001	-	<0.001	-	<0.001	-	-	<0.001	<0.001	<0.001	<0.001
	Anthracene	mg/L	0.001		<0.001	<0.001	-	<0.001	<0.001	-	<0.001	-	<0.001	-	<0.001	-	-	<0.001	<0.001	<0.001	<0.001
	Benz(a)anthracene	mg/L	0.001		<0.001	<0.001	-	<0.001	<0.001	-	<0.001	-	<0.001	-	<0.001	-	-	<0.001	<0.001	<0.001	<0.001
	Benzo(a) pyrene	mg/L	0.001		<0.001	<0.001	-	<0.001	<0.001	-	<0.001	-	<0.001	-	<0.001	-	-	<0.001	<0.001	<0.001	<0.001
	Benzo(k)fluoranthene	mg/L	0.001		<0.001	<0.001	-	<0.001	<0.001	-	<0.001	-	<0.001	-	<0.001	-	-	<0.001	<0.001	<0.001	<0.001
	Benzo(g,h,i)perylene	mg/L	0.001		<0.001	<0.001	-	<0.001	<0.001	-	<0.001	-	<0.001	-	<0.001	-	-	<0.001	<0.001	<0.001	<0.001
	Chrysene	mg/L	0.001		<0.001	<0.001	-	<0.001	<0.001	-	<0.001	-	<0.001	-	<0.001	-	-	<0.001	<0.001	<0.001	<0.001
	Dibenz(a,h)anthracene	mg/L	0.001		<0.001	<0.001	-	<0.001	<0.001	-	<0.001	-	<0.001	-	<0.001	-	-	<0.001	<0.001	<0.001	<0.001
	Fluoranthene	mg/L	0.001		<0.001	<0.001	-	<0.001	<0.001	-	<0.001	-	<0.001	-	<0.001	-	-	<0.001	<0.001	<0.001	<0.001

Appendix B3
Table 4
Analytical Results of the Groundwater

					Location Code	BH2001	BH2002	BH2002	BH2003	BH2004	BH2005	BH2011	BH2023	BH2031	BH2031	BH2032	BH2032	BH2033	BH4001	BH4002	BH4002	BH4003A
					Sampled Date	24/05/2016	24/05/2016	12/07/2016	24/05/2016	24/05/2016	7/07/2016	7/07/2016	11/07/2016	24/05/2016	11/07/2016	18/05/2016	6/07/2016	7/07/2016	20/05/2016	24/05/2016	11/07/2016	24/05/2016
					Field ID	EWL-BH2001	EWL-BH2002	BH2002	EWL-BH2003	EWL-BH2004	BH2005	BH2011	BH2023	EWL-BH2031	BH2031	BH2032	BH2032	BH2033	BH4001	EWL-BH4002	BH4002	EWL-BH4003A
					Screen Geology	Basalt	Basalt	Basalt	Basalt	Basalt	Basalt	Basalt	Basalt	Tuff	Tuff	Fill	Fill	Basalt	Basalt	Basalt	Basalt	Basalt
Chemical Group	**Chem Name**	**Units**	**EQL**	ANZECC 2000 MW 90%																		
	Fluorene	mg/L	0.001		<0.001	<0.001	-	<0.001	<0.001	-	<0.001	-	<0.001	-	<0.001	-	-	<0.001	<0.001	<0.001	<0.001
	Indeno(1,2,3-c,d)pyrene	mg/L	0.001		<0.001	<0.001	-	<0.001	<0.001	-	<0.001	-	<0.001	-	<0.001	-	-	<0.001	<0.001	<0.001	<0.001
	Naphthalene	mg/L	0.001	0.09	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	-	<0.001	-	<0.001	-	-	<0.001	<0.001	<0.001	<0.001
	Phenanthrene	mg/L	0.001		<0.001	<0.001	-	<0.001	<0.001	-	<0.001	-	<0.001	-	<0.001	-	-	<0.001	<0.001	<0.001	<0.001
Miscellaneous	TOC	mg/L	5		-	-	-	-	-	-	-	-	-	-	13	-	-	<5	-	-	-
	Total Dissolved Solids	mg/L	10		-	-	-	-	-	-	-	-	-	-	680	-	-	210	-	-	-
	Electrical conductivity *(lab)	mS/m	0.1		-	-	-	-	-	-	-	-	-	-	140	-	-	28	-	-	-
	pH (Lab)	pH_Units	0.1		-	-	-	-	-	-	-	-	-	-	7.5	-	-	7.5	-	-	-
Nutrients	Nitrogen (Organic)	µg/L	200		<200	15,000	<200	600	600	<200	200	<200	200	<200	1000	48,000	300	<200	500	<200	600
	Ammonia as N	mg/L	0.01	1.2	2.6	79	88	4.5	0.86	0.28	0.49	7.9	0.21	4.9	37	48	0.28	0.02	0.81	1.6	0.02
	Nitrate (as N)	mg/L	0.02		0.02	<0.02	<0.02	0.03	<0.02	<0.02	<0.02	0.03	0.12	0.07	<0.02	0.03	<0.02	3.8	<0.02	<0.02	5.1
	Nitrite (as N)	mg/L	0.02		<0.02	<0.02	<0.02	<0.02	0.03	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.04
	Nitrogen (Total)	mg/L	0.05		2.7	94	88	5.1	1.5	<0.05 - 0.4	<0.05 - 0.7	<0.05 - 7.9	0.5	0.09 - 5	38	<0.05 - 48	<0.05 - 0.6	3.8	1.3	<0.05 - 1.6	5.8
	Phosphate total (P)	mg/L	0.01		0.61	<0.05	-	0.44	0.91	-	-	-	0.41	-	0.49	-	-	0.13	0.78	-	0.41
	Sulphate as S	mg/L	5		68	28	23	<15	130	5.2	<5	8.9	99	36	<5	<20	9.2	6.8	270	290	10
	Nitrate-N + Nitrite-N	mg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	-	-	-	0.12	-	<0.05	-	-	3.8	<0.05	-	5.2
	Kjeldahl Nitrogen Total	mg/L	0.2		2.7	94	88	5.1	1.5	0.4	0.7	7.9	0.4	4.9	38	48	0.6	<0.2	1.3	1.6	0.6
Alkalinity	Alkalinity (total) as CaCO3	mg/L	20		930	1100	-	430	600	-	-	-	150	-	960	-	-	110	350	-	65
	Alkalinity (Bicarbonate as CaCO3)	mg/L	20		930	1100	1100	430	600	190	280	440	150	410	960	930	210	110	350	300	59
	Alkalinity (Hydroxide) as CaCO3	mg/L	10		<10	<10	-	<10	<10	-	-	-	<10	-	-	-	-	-	<10	-	<10
	Carbonate Alkalinity (as CaCO3)	mg/L	10		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Major Ions	Calcium	mg/L	0.5		120	100	110	49	36	27	28	72	480	330	140	150	40	20	180	190	20
	Chloride	mg/L	1		600	100	110	22	310	33	26	450	3800	2300	55	37	23	26	7700	7800	42
	Magnesium	mg/L	0.5		72	37	43	28	58	20	26	68	870	450	35	40	20	12	420	440	3.6
	Potassium	mg/L	0.5		35	36	38	17	22	7.4	9.2	20	58	39	18	18	9.6	4	140	150	8.8
	Sodium	mg/L	0.5		440	190	170	41	400	40	52	290	370	250	84	62	45	30	3800	3900	35
OC Pesticides	Aldrin + Dieldrin - Calc	µg/L			<10	<10	-	<10	<10	-	<10	-	<10	-	<10	-	-	<10	<10	<10	<10
	OCPs (Sum of Total) - Calc	µg/L			<95	<95	-	<95	<95	-	<90	-	<95	-	<90	-	-	<90	<95	<90	<95
	4,4 DDD	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
	4,4 DDE	mg/L	0.001		<0.01	<0.01	-	<0.01	<0.01	-	<0.005	-	<0.01	-	<0.005	-	-	<0.005	<0.01	<0.005	<0.01
	4,4 DDT	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
	a-BHC	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
	Aldrin	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
	b-BHC	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
	d-BHC	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
	DDT + DDD + DDE - Calc	mg/L			<0.02	<0.02	-	<0.02	<0.02	-	<0.015	-	<0.02	-	<0.015	-	-	<0.015	<0.02	<0.015	<0.02
	Dieldrin	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
	Endosulfan I	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
	Endosulfan II	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
	Endosulfan sulphate	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
	Endrin	mg/L	0.001	0.00001	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
	Endrin aldehyde	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
	Endrin ketone	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
	g-BHC (Lindane)	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
	Heptachlor	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
	Heptachlor epoxide	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
	Hexachlorobenzene	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
	Methoxychlor	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
Phenols	2,3,4,6-tetrachlorophenol	µg/L	10		<10	<10	-	<10	<10	-	<10	-	<10	-	<10	-	-	<10	<10	<10	<10
	2,4-dinitrophenol	µg/L	1		<30	<30	-	<30	<30	-	<30	-	<30	-	<30	-	-	<30	<30	<30	<30
	2,6-dichlorophenol	µg/L	3		<3	<3	-	<3	<3	-	<3	-	<3	-	<3	-	-	<3	<3	<3	<3
	3-methylcholanthrene	µg/L	1		<5	<5	-	<5	<5	-	<5	-	<5	-	<5	-	-	<5	<5	<5	<5
	4-nitrophenol	µg/L	1		<30	<30	-	<30	<30	-	<30	-	<30	-	<30	-	-	<30	<30	<30	<30
	Acetophenone	µg/L	1		<5	<5	-	<5	<5	-	<5	-	<5	-	<5	-	-	<5	<5	<5	<5
	Phenols (Sum of Total) - Calc	µg/L			<168	<168	-	<168	<168	-	<143	-	<168	-	<168	-	-	<168	<168	<143	<168
	2,4,5-trichlorophenol	mg/L	0.001		<0.01	<0.01	-	<0.01	<0.01	-	<0.01	-	<0.01	-	<0.01	-	-	<0.01	<0.01	<0.01	<0.01
	2,4,6-trichlorophenol	mg/L	0.01		<0.01	<0.01	-	<0.01	<0.01	-	<0.01	-	<0.01	-	<0.01	-	-	<0.01	<0.01	<0.01	<0.01
	2,4-dichlorophenol	mg/L	0.001		<0.003	<0.003	-	<0.003	<0.003	-	<0.003	-	<0.003	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003
	2,4-dimethylphenol	mg/L	0.001		<0.003	<0.003	-	<0.003	<0.003	-	<0.003	-	<0.003	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003
	2-chlorophenol	mg/L	0.003		<0.003	<0.003	-	<0.003	<0.003	-	<0.003	-	<0.003	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003
	2-methylnaphthalene	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
	2-methylphenol	mg/L	0.003		<0.003	<0.003	-	<0.003	<0.003	-	<0.003	-	<0.003	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003
	2-nitrophenol	mg/L	0.005		<0.01	<0.01	-	<0.01	<0.01	-	<0.01	-	<0.01	-	<0.01	-	-	<0.01	<0.01	<0.01	<0.01
	3-&4-methylphenol	mg/L	0.006		<0.006	<0.006	-	<0.006	<0.006	-	<0.006	-	<0.006	-	<0.006	-	-	<0.006	<0.006	<0.006	<0.006
	4-chloro-3-methylphenol	mg/L	0.01		<0.01	<0.01	-	<0.01	<0.01	-	<0.01	-	<0.01	-	<0.01	-	-	<0.01	<0.01	<0.01	<0.01
	Pentachlorophenol	mg/L	0.01	0.033	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	-	<0.01	-	<0.01	-	-	<0.01	<0.01	<0.01	<0.01
	Phenol	mg/L	0.003	0.52	<0.003	<0.003	-	<0.003	<0.003	-	<0.003	-	<0.003	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003
VOCs	1,2,3-trichlorobenzene	µg/L	1		<5	<5	-	<5	<5	-	<5	-	<5	-	<5	-	-	<5	<5	<5	<5
	Formaldehyde	µg/L	200		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1,2,4-trichlorobenzene	mg/L	0.001	0.14	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
	1,2-dichlorobenzene	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
	1,3-dichlorobenzene	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
	1,4-dichlorobenzene	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005

Appendix B3
Table 4
Analytical Results of the Groundwater

					Location Code	BH2001	BH2002	BH2002	BH2003	BH2004	BH2005	BH2011	BH2023	BH2031	BH2031	BH2032	BH2032	BH2033	BH4001	BH4002	BH4002	BH4003A
					Sampled Date	24/05/2016	24/05/2016	12/07/2016	24/05/2016	24/05/2016	7/07/2016	7/07/2016	11/07/2016	24/05/2016	11/07/2016	18/05/2016	6/07/2016	7/07/2016	20/05/2016	24/05/2016	11/07/2016	24/05/2016
					Field ID	EWL-BH2001	EWL-BH2002	BH2002	EWL-BH2003	EWL-BH2004	BH2005	BH2011	BH2023	EWL-BH2031	BH2031	BH2032	BH2032	BH2033	BH4001	EWL-BH4002	BH4002	EWL-BH4003A
					Screen Geology	Basalt	Basalt	Basalt	Basalt	Basalt	Basalt	Basalt	Basalt	Tuff	Tuff	Fill	Fill	Basalt	Basalt	Basalt	Basalt	Basalt
Chemical Group	**Chem Name**	**Units**	**EQL**	ANZECC 2000 MW 90%																		
	Hexachlorobutadiene	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
SVOCs	1,2,3,4-tetrachlorobenzene	µg/L	1		<5	<5	-	<5	<5	-	<5	-	<5	-	<5	-	-	<5	<5	<5	<5
	1,2,3,5-Tetrachlorobenzene	µg/L	1		<5	<5	-	<5	<5	-	<5	-	<5	-	<5	-	-	<5	<5	<5	<5
	1,2,4,5-tetrachlorobenzene	µg/L	1		<5	<5	-	<5	<5	-	<5	-	<5	-	<5	-	-	<5	<5	<5	<5
	1,3,5-Trichlorobenzene	µg/L	1		<5	<5	-	<5	<5	-	<5	-	<5	-	<5	-	-	<5	<5	<5	<5
	1-Chloronaphthalene	µg/L	1		<5	<5	-	<5	<5	-	<5	-	<5	-	<5	-	-	<5	<5	<5	<5
	1-naphthylamine	µg/L	1		<5	<5	-	<5	<5	-	<5	-	<5	-	<5	-	-	<5	<5	<5	<5
	2-naphthylamine	µg/L	1		<5	<5	-	<5	<5	-	<5	-	<5	-	<5	-	-	<5	<5	<5	<5
	2-nitroaniline	µg/L	1		<5	<5	-	<5	<5	-	<5	-	<5	-	<5	-	-	<5	<5	<5	<5
	3,3-Dichlorobenzidine	µg/L	1		<5	<5	-	<5	<5	-	<5	-	<5	-	<5	-	-	<5	<5	<5	<5
	4-(dimethylamino) azobenzene	µg/L	1		<5	<5	-	<5	<5	-	<5	-	<5	-	<5	-	-	<5	<5	<5	<5
	4,6-Dinitro-2-methylphenol	µg/L	5		<30	<30	-	<30	<30	-	<5	-	<30	-	<30	-	-	<30	<30	<5	<30
	7,12-dimethylbenz(a)anthracene	µg/L	1		<5	<5	-	<5	<5	-	<5	-	<5	-	<5	-	-	<5	<5	<5	<5
	Aniline	µg/L	1		<5	<5	-	<5	<5	-	<5	-	<5	-	<5	-	-	<5	<5	<5	<5
	Benzyl chloride	µg/L	1		<5	<5	-	<5	<5	-	<5	-	<5	-	<5	-	-	<5	<5	<5	<5
	Dibenz(a,j)acridine	µg/L	1		<5	<5	-	<5	<5	-	<5	-	<5	-	<5	-	-	<5	<5	<5	<5
	Diphenylamine	µg/L	1		<5	<5	-	<5	<5	-	<5	-	<5	-	<5	-	-	<5	<5	<5	<5
	Hexachlorocyclopentadiene	µg/L	1		<5	<5	-	<5	<5	-	<5	-	<5	-	<5	-	-	<5	<5	<5	<5
	N-nitrosodi-n-butylamine	µg/L	1		<5	<5	-	<5	<5	-	<5	-	<5	-	<5	-	-	<5	<5	<5	<5
	N-nitrosopiperidine	µg/L	1		<5	<5	-	<5	<5	-	<5	-	<5	-	<5	-	-	<5	<5	<5	<5
	Pentachlorobenzene	µg/L	1		<5	<5	-	<5	<5	-	<5	-	<5	-	<5	-	-	<5	<5	<5	<5
	Trifluralin	µg/L	1		<5	<5	-	<5	<5	-	<5	-	<5	-	<5	-	-	<5	<5	<5	<5
	4-bromophenyl phenyl ether	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
	4-chlorophenyl phenyl ether	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
	Bis(2-chloroethoxy) methane	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
	Bis(2-chloroisopropyl) ether	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
	Dibenzofuran	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
	Hexachloroethane	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
	N-nitrosodi-n-propylamine	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
Phthalates	Bis(2-ethylhexyl) phthalate	mg/L	0.001		-	-	-	-	-	-	<0.01	-	-	-	0.015	-	-	<0.005	-	<0.005	-
	Butyl benzyl phthalate	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
	Diethylphthalate	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
	Dimethyl phthalate	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
	Di-n-butyl phthalate	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
	Di-n-octyl phthalate	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
Chlorinated Hydrocarbons	2-chloronaphthalene	µg/L	1		<5	<5	-	<5	<5	-	<5	-	<5	-	<5	-	-	<5	<5	<5	<5
Explosives	2,4-Dinitrotoluene	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
	2,6-dinitrotoluene	mg/L	0.001		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
	Nitrobenzene	mg/L	0.05		<0.05	<0.05	-	<0.05	<0.05	-	<0.05	-	<0.05	-	<0.05	-	-	<0.05	<0.05	<0.05	<0.05
Herbicides	Pronamide	µg/L	1		<5	<5	-	<5	<5	-	<5	-	<5	-	<5	-	-	<5	<5	<5	<5
Nitroaromatics	2-Picoline	µg/L	1		<5	<5	-	<5	<5	-	<5	-	<5	-	<5	-	-	<5	<5	<5	<5
	4-aminobiphenyl	µg/L	1		<5	<5	-	<5	<5	-	<5	-	<5	-	<5	-	-	<5	<5	<5	<5
	Pentachloronitrobenzene	µg/L	1		<5	<5	-	<5	<5	-	<5	-	<5	-	<5	-	-	<5	<5	<5	<5

Appendix B3
Table 4
Analytical Results of the Groundwater

				Location Code	BH4003	BH4004A	BH4004A	BH4004	BH4004	BH4005	BH4006	BH4006	BH4007	BH4008	BH4009	BH4009	BH4010A	BH4010	BH4011A	BH4011A	BH4011
				Sampled Date	24/05/2016	20/05/2016	7/07/2016	20/05/2016	7/07/2016	24/05/2016	20/05/2016	11/07/2016	24/05/2016	24/05/2016	20/05/2016	7/07/2016	24/05/2016	24/05/2016	24/05/2016	12/07/2016	24/05/2016
				Field ID	EWL-BH4003	BH4004A	BH4004A	BH4004	BH4004	EWL-BH4005	BH4006	BH4006	EWL-BH4007	EWL-BH4008	BH4009	BH4009	EWL-BH4010A	EWL-BH4010	EWL-BH4011A	BH4011A	EWL-BH4011
				Screen Geology	Waitemata	Basalt	Basalt	Waitemata	Waitemata	Basalt	Basalt	Basalt	Basalt	Basalt	Basalt	Basalt	Basalt	Tauranga	Basalt	Basalt	Tuff
Chemical Group	Chem Name	Units	EQL	ANZECC 2000 MW 90%																	
Field	ORP	mV			109.5	-131.7	-46.6	32.6	-5	179.2	-9.9	131.4	-78.5	-0.4	-26.5	-5.9	-78.2	-37.9	-52.2	12	-10
	SP Conductivity	µS/cm			260.5	2316	1650	6012	4983	309.9	708	280.9	1854	643	21,440	8209	965	673	717	552.7	656
	Dissolved Oxygen (Field) %	%			-	-	31.4	-	35.8	-	-	48.1	-	-	-	22.5	-	-	-	18.1	-
	Dissolved Oxygen (Field) % (Filtered)	%			15.1	8	-	15.1	-	23	14.3	-	9.6	5.5	12.1	-	-	6.7	10.4	-	9.2
	Dissolved Oxygen (Field)	mg/L			-	-	3.1	-	3.33	-	-	4.93	-	-	-	2.24	-	-	-	1.7	-
	Dissolved Oxygen (Field) (Filtered)	mg/L			1.44	0.83	-	1.45	-	2.17	1.34	-	0.89	0.53	1.07	-	0.67	0.66	0.99	-	0.87
	Temp (Field)	oC			17.5	18.2	17.1	17.9	16.8	18.3	18.2	17.1	18.4	18.2	17.2	17.8	18.3	16	17.5	18.3	17.9
	pH (Field)	pH_Units			7.19	7.87	7.63	7.13	7.09	6.99	6.96	6.87	7.12	6.99	7.02	7.32	7.33	7.06	7.38	6.88	6.88
	Electrical Conductivity (Field)	uS/cm			723.1	2012	1496	4333	4197	269.9	516	238.4	1622	560	19,260	7081	791	566	614	481.8	568
Metals	Aluminium (Filtered)	mg/L	0.05		-	-	0.46	-	2.3	-	-	0.74	-	-	-	0.12	-	-	-	11	-
	Antimony (Filtered)	mg/L	0.005		-	-	<0.005	-	<0.005	-	-	<0.005	-	-	-	<0.005	-	-	-	<0.005	-
	Arsenic	mg/L	0.001		-	0.002	-	<0.001	-	-	<0.001	-	-	-	0.012	-	-	-	-	-	-
	Arsenic (Filtered)	mg/L	0.001		<0.001	-	<0.001	-	0.001	<0.001	-	<0.001	<0.001	<0.001	-	0.003	0.004	0.003	0.004	0.002	0.002
	Barium (Filtered)	mg/L	0.02		-	-	0.03	-	0.5	-	-	0.03	-	-	-	0.07	-	-	-	0.11	-
	Beryllium	mg/L	0.001		-	<0.001	-	<0.001	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-
	Beryllium (Filtered)	mg/L	0.001		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Boron	mg/L	0.05		-	0.63	-	0.71	-	-	0.18	-	-	-	1.8	-	-	-	-	-	-
	Boron (Filtered)	mg/L	0.05		-	-	0.51	-	0.48	-	-	<0.05	-	-	-	0.92	-	-	-	0.46	-
	Cadmium	mg/L	0.0002	0.014	-	<0.0002	-	<0.0002	-	-	<0.0002	-	-	-	0.0004	-	-	-	-	-	-
	Cadmium (Filtered)	mg/L	0.0002	0.014	<0.0002	-	<0.0002	-	<0.0002	0.0003	-	<0.0002	0.0007	<0.0002	-	<0.0002	<0.0002	0.0007	<0.0002	0.0002	<0.0002
	Chromium (hexavalent)	mg/L	0.001	0.02	-	<0.001	-	<0.001	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-
	Chromium (III+VI) (Filtered)	mg/L	0.001	0.02	<0.001	-	<0.001	-	<0.001	<0.001	-	0.001	<0.001	<0.001	-	<0.001	0.002	0.003	0.007	0.006	<0.001
	Cobalt	mg/L	0.001	0.014	-	0.006	-	0.004	-	-	0.004	-	-	-	0.011	-	-	-	-	-	-
	Cobalt (Filtered)	mg/L	0.001	0.014	-	-	0.001	-	0.003	-	-	0.001	-	-	-	0.001	-	-	-	0.016	-
	Copper	mg/L	0.001	0.003	-	0.025	-	0.001	-	-	0.004	-	-	-	0.067	-	-	-	-	-	-
	Copper (Filtered)	mg/L	0.001	0.003	0.005	-	<0.001	-	0.003	0.003	-	0.027	0.033	0.004	-	0.03	0.016	0.03	0.075	0.38	0.008
	Iron (Filtered)	mg/L	0.05		-	-	1.4	-	8.4	-	-	3.7	-	-	-	6.8	-	-	-	-	-
	Lead	mg/L	0.001	0.0066	-	0.002	-	<0.001	-	-	<0.001	-	-	-	0.11	-	-	-	-	-	-
	Lead (Filtered)	mg/L	0.001	0.0066	0.002	-	<0.001	-	0.003	<0.001	-	0.002	<0.001	<0.001	-	0.014	0.003	0.001	0.022	0.014	<0.001
	Lithium (Filtered)	mg/L	0.005		-	-	0.0079	-	0.092	-	-	<0.005	-	-	-	0.014	-	-	-	<0.005	-
	Manganese	mg/L	0.005		-	0.088	-	0.29	-	-	1.4	-	-	-	1.6	-	-	-	-	-	-
	Manganese (Filtered)	mg/L	0.005		-	-	0.13	-	0.62	-	-	0.058	-	-	-	0.62	-	-	-	2	-
	Mercury	mg/L	0.0001	0.0007	-	<0.0001	-	<0.0001	-	-	<0.0001	-	-	-	<0.0001	-	-	-	-	-	-
	Mercury (Filtered)	mg/L	0.0001	0.0007	<0.0001	-	-	-	-	<0.0001	-	-	<0.0001	<0.0001	-	-	<0.0001	<0.0001	<0.0001	-	<0.0001
	Molybdenum (Filtered)	mg/L	0.005		-	-	<0.005	-	<0.005	-	-	<0.005	-	-	-	<0.005	-	-	-	<0.005	-
	Nickel	mg/L	0.001	0.2	-	0.017	-	0.004	-	-	0.005	-	-	-	0.025	-	-	-	-	-	-
	Nickel (Filtered)	mg/L	0.001	0.2	0.004	-	0.002	-	0.004	<0.001	-	0.003	0.008	0.004	-	0.002	0.016	0.012	0.048	0.048	0.007
	Selenium	mg/L	0.001		-	<0.001	-	<0.001	-	-	<0.001	-	-	-	0.001	-	-	-	-	-	-
	Selenium (Filtered)	mg/L	0.001		-	-	<0.001	-	<0.001	-	-	<0.001	-	-	-	<0.001	-	-	-	0.001	-
	Silver (Filtered)	mg/L	0.005	0.0018	-	-	<0.005	-	<0.005	-	-	<0.005	-	-	-	<0.005	-	-	-	<0.005	-
	Strontium (Filtered)	mg/L	0.005		-	-	-	-	-	-	-	0.067	-	-	-	-	-	-	-	0.34	-
	Thallium (Filtered)	mg/L	0.001		-	-	<0.001	-	<0.001	-	-	<0.001	-	-	-	<0.001	-	-	-	<0.001	-
	Tin (Filtered)	mg/L	0.005		-	-	<0.005	-	<0.005	-	-	<0.005	-	-	-	<0.005	-	-	-	<0.005	-
	Uranium (Filtered)	mg/L	0.005		-	-	<0.005	-	<0.005	-	-	<0.005	-	-	-	<0.005	-	-	-	<0.005	-
	Vanadium (Filtered)	mg/L	0.005	0.16	-	-	<0.005	-	0.007	-	-	0.008	-	-	-	<0.005	-	-	-	0.036	-
	Zinc	mg/L	0.005	0.023	-	0.017	-	0.011	-	-	0.037	-	-	-	0.15	-	-	-	-	-	-
	Zinc (Filtered)	mg/L	0.001	0.023	0.02	-	0.006	-	0.013	0.012	-	0.013	0.014	0.011	-	0.016	0.028	0.019	0.11	0.12	0.013
TPH	C7-C9	mg/L	0.1		<0.1	-	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	C10 - C14	mg/L	0.05		<0.2	<0.05	<0.2	<0.05	<0.2	<0.2	<0.05	<0.2	<0.2	<0.2	<0.05	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	C15-C36	mg/L	0.4		<0.4	-	<0.4	-	<0.4	<0.4	-	<0.4	<0.4	<0.4	-	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
	C7-C36	mg/L	0.7		<0.7	-	<0.7	-	<0.7	<0.7	-	<0.7	<0.7	<0.7	-	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7
BTEX & MAH	Benzene	mg/L	0.001	0.9	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	BTEX (Sum of Total) - Calc	µg/L			<6	<6	<6	<6	<6	<6	<6	<6	<6	4.5	<6	<6	<6	<6	<6	<6	<6
	Ethylbenzene	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Toluene	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Xylene (o)	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Xylene (m & p)	mg/L	0.002		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
	Xylene Total	µg/L	3		<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
	Xylenes (Sum of Total) - Calc	µg/L			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PAH	PAHs (Sum of Total) - Calc	µg/L			<21	<21	-	<21	-	<21	<21	-	<21	<21	<21	-	<21	<21	<21	-	<21
	Benzo[b+j]fluoranthene	mg/L	0.001		<0.001	<0.001	-	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001
	Pyrene	mg/L	0.001		<0.001	<0.001	-	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001
	Carcinogenic PAHs (as B(a)P TEQ) - Calc	µg/L			<2.42	<2.42	-	<2.42	-	<2.42	<2.42	-	<2.42	<2.42	<2.42	-	<2.42	<2.42	<2.42	-	<2.42
	Acenaphthene	mg/L	0.001		<0.001	<0.001	-	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001
	Acenaphthylene	mg/L	0.001		<0.001	<0.001	-	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001
	Anthracene	mg/L	0.001		<0.001	<0.001	-	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001
	Benz(a)anthracene	mg/L	0.001		<0.001	<0.001	-	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001
	Benzo(a) pyrene	mg/L	0.001		<0.001	<0.001	-	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001
	Benzo(k)fluoranthene	mg/L	0.001		<0.001	<0.001	-	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001
	Benzo(g,h,i)perylene	mg/L	0.001		<0.001	<0.001	-	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001
	Chrysene	mg/L	0.001		<0.001	<0.001	-	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001
	Dibenz(a,h)anthracene	mg/L	0.001		<0.001	<0.001	-	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001
	Fluoranthene	mg/L	0.001		<0.001	<0.001	-	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001

Appendix B3
Table 4
Analytical Results of the Groundwater

				Location Code	BH4003	BH4004A	BH4004A	BH4004	BH4004	BH4005	BH4006	BH4006	BH4007	BH4008	BH4009	BH4009	BH4010A	BH4010	BH4011A	BH4011A	BH4011
				Sampled Date	24/05/2016	20/05/2016	7/07/2016	20/05/2016	7/07/2016	24/05/2016	20/05/2016	11/07/2016	24/05/2016	24/05/2016	20/05/2016	7/07/2016	24/05/2016	24/05/2016	24/05/2016	12/07/2016	24/05/2016
				Field ID	EWL-BH4003	BH4004A	BH4004A	BH4004	BH4004	EWL-BH4005	BH4006	BH4006	EWL-BH4007	EWL-BH4008	BH4009	BH4009	EWL-BH4010A	EWL-BH4010	EWL-BH4011A	BH4011A	EWL-BH4011
				Screen Geology	Waitemata	Basalt	Basalt	Waitemata	Waitemata	Basalt	Basalt	Basalt	Basalt	Basalt	Basalt	Basalt	Basalt	Tauranga	Basalt	Basalt	Tuff
Chemical Group	**Chem Name**	**Units**	**EQL**	ANZECC 2000 MW 90%																	
	Fluorene	mg/L	0.001		<0.001	<0.001	-	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001
	Indeno(1,2,3-c,d)pyrene	mg/L	0.001		<0.001	<0.001	-	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001
	Naphthalene	mg/L	0.001	0.09	<0.001	<0.001	-	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001
	Phenanthrene	mg/L	0.001		<0.001	<0.001	-	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001
Miscellaneous	TOC	mg/L	5		-	14	-	6.8	-	-	<5	-	-	-	5.1	-	-	-	-	-	-
	Total Dissolved Solids	mg/L	10		-	1200	-	3400	-	-	460	-	-	-	15,000	-	-	-	-	-	-
	Electrical conductivity *(lab)	mS/m	0.1		-	190	-	380	-	-	60	-	-	-	1700	-	-	-	-	-	-
	pH (Lab)	pH_Units	0.1		-	8	-	7.5	-	-	6.8	-	-	-	7.1	-	-	-	-	-	-
Nutrients	Nitrogen (Organic)	µg/L	200		<200	<200	300	<200	<200	200	<200	<200	<200	<200	300	<200	300	500	200	1500	200
	Ammonia as N	mg/L	0.01	1.2	<0.01	0.12	0.28	4.8	4.4	<0.01	0.13	0.02	0.8	0.09	0.29	0.48	0.91	0.09	0.76	1.3	2
	Nitrate (as N)	mg/L	0.02		3.1	<0.02	<0.02	0.03	<0.02	3.6	1.6	1.4	0.36	0.75	0.32	<0.02	<0.02	0.76	0.24	0.04	<0.02
	Nitrite (as N)	mg/L	0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Nitrogen (Total)	mg/L	0.05		3.1	<0.2	<0.05 - 0.6	4.3	<0.05 - 4.4	3.8	1.6	1.4	1.3	0.8	0.9	<0.05 - 0.5	1.2	1.4	1.3	2.9	2.2
	Phosphate total (P)	mg/L	0.01		0.2	1.5	-	0.06	-	<0.05	0.19	-	0.85	0.18	0.79	-	<0.05	0.27	0.99	-	0.48
	Sulphate as S	mg/L	5		8.6	<5	<5	<5	<5	19	79	17	380	35	360	130	140	35	24	5.4	11
	Nitrate-N + Nitrite-N	mg/L	0.05		3.1	<0.05	-	<0.05	-	3.6	1.6	-	0.38	0.76	0.32	-	<0.05	0.77	0.26	0.05	<0.05
	Kjeldahl Nitrogen Total	mg/L	0.2		<0.2	<0.2	0.6	4.8	4.4	0.2	<0.2	<0.2	0.9	<0.2	0.6	0.5	1.2	0.6	1	2.8	2.2
Alkalinity	Alkalinity (total) as CaCO3	mg/L	20		81	480	-	390	-	61	120	-	120	180	220	-	210	120	290	-	420
	Alkalinity (Bicarbonate as CaCO3)	mg/L	20		81	480	540	390	370	61	120	73	120	180	220	240	210	120	290	230	420
	Alkalinity (Hydroxide) as CaCO3	mg/L	10		<10	-	-	-	-	<10	-	-	<10	<10	-	-	<10	<10	<10	-	<10
	Carbonate Alkalinity (as CaCO3)	mg/L	10		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Major Ions	Calcium	mg/L	0.5		12	11	17	200	200	16	32	11	180	23	220	75	110	39	66	47	36
	Chloride	mg/L	1		20	450	490	1500	1400	21	23	20	58	47	8400	2600	48	48	28	36	38
	Magnesium	mg/L	0.5		11	36	42	87	83	13	49	14	140	34	570	160	54	34	17	19	25
	Potassium	mg/L	0.5		5	22	21	25	24	5	6.2	2.9	26	6.1	160	55	16	9.4	8.2	10	11
	Sodium	mg/L	0.5		26	420	380	720	620	28	48	24	150	56	4200	1400	71	50	46	54	83
OC Pesticides	Aldrin + Dieldrin - Calc	µg/L			<10	<10	-	<10	-	<10	<10	-	<10	<10	<10	-	<10	<10	<10	-	<10
	OCPs (Sum of Total) - Calc	µg/L			<95	<95	-	<95	-	<95	<95	-	<95	<90	<95	-	<95	<95	<95	-	<95
	4,4 DDD	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
	4,4 DDE	mg/L	0.001		<0.01	<0.01	-	<0.01	-	<0.01	<0.01	-	<0.01	<0.005	<0.01	-	<0.01	<0.01	<0.01	-	<0.01
	4,4 DDT	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
	a-BHC	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
	Aldrin	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
	b-BHC	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
	d-BHC	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
	DDT + DDD + DDE - Calc	mg/L			<0.02	<0.02	-	<0.02	-	<0.02	<0.02	-	<0.02	<0.015	<0.02	-	<0.02	<0.02	<0.02	-	<0.02
	Dieldrin	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
	Endosulfan I	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
	Endosulfan II	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
	Endosulfan sulphate	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
	Endrin	mg/L	0.001	0.00001	<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
	Endrin aldehyde	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
	Endrin ketone	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
	g-BHC (Lindane)	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
	Heptachlor	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
	Heptachlor epoxide	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
	Hexachlorobenzene	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
	Methoxychlor	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
Phenols	2,3,4,6-tetrachlorophenol	µg/L	10		<10	<10	-	<10	-	<10	<10	-	<10	<10	<10	-	<10	<10	<10	-	<10
	2,4-dinitrophenol	µg/L	1		<30	<30	-	<30	-	<30	<30	-	<30	<30	<30	-	<30	<30	<30	-	<30
	2,6-dichlorophenol	µg/L	3		<3	<3	-	<3	-	<3	<3	-	<3	<3	<3	-	<3	<3	<3	-	<3
	3-methylcholanthrene	µg/L	1		<5	<5	-	<5	-	<5	<5	-	<5	<5	<5	-	<5	<5	<5	-	<5
	4-nitrophenol	µg/L	1		<30	<30	-	<30	-	<30	<30	-	<30	<30	<30	-	<30	<30	<30	-	<30
	Acetophenone	µg/L	1		<5	<5	-	<5	-	<5	<5	-	<5	<5	<5	-	<5	<5	<5	-	<5
	Phenols (Sum of Total) - Calc	µg/L			<168	<168	-	<168	-	<168	<168	-	<168	<168	<168	-	<168	<168	<168	-	<168
	2,4,5-trichlorophenol	mg/L	0.001		<0.01	<0.01	-	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	-	<0.01
	2,4,6-trichlorophenol	mg/L	0.01		<0.01	<0.01	-	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	-	<0.01
	2,4-dichlorophenol	mg/L	0.001		<0.003	<0.003	-	<0.003	-	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003
	2,4-dimethylphenol	mg/L	0.001		<0.003	<0.003	-	<0.003	-	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003
	2-chlorophenol	mg/L	0.003		<0.003	<0.003	-	<0.003	-	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003
	2-methylnaphthalene	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
	2-methylphenol	mg/L	0.003		<0.003	<0.003	-	<0.003	-	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003
	2-nitrophenol	mg/L	0.005		<0.01	<0.01	-	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	-	<0.01
	3-&4-methylphenol	mg/L	0.006		<0.006	<0.006	-	<0.006	-	<0.006	<0.006	-	<0.006	<0.006	<0.006	-	<0.006	<0.006	<0.006	-	<0.006
	4-chloro-3-methylphenol	mg/L	0.01		<0.01	<0.01	-	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	-	<0.01
	Pentachlorophenol	mg/L	0.01	0.033	<0.01	<0.01	-	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	-	<0.01
	Phenol	mg/L	0.003	0.52	<0.003	<0.003	-	<0.003	-	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003
VOCs	1,2,3-trichlorobenzene	µg/L	1		<5	<5	-	<5	-	<5	<5	-	<5	<5	<5	-	<5	<5	<5	-	<5
	Formaldehyde	µg/L	200		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1,2,4-trichlorobenzene	mg/L	0.001	0.14	<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
	1,2-dichlorobenzene	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
	1,3-dichlorobenzene	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
	1,4-dichlorobenzene	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005

Appendix B3
Table 4
Analytical Results of the Groundwater

				Location Code	BH4003	BH4004A	BH4004A	BH4004	BH4004	BH4005	BH4006	BH4006	BH4007	BH4008	BH4009	BH4009	BH4010A	BH4010	BH4011A	BH4011A	BH4011
				Sampled Date	24/05/2016	20/05/2016	7/07/2016	20/05/2016	7/07/2016	24/05/2016	20/05/2016	11/07/2016	24/05/2016	24/05/2016	20/05/2016	7/07/2016	24/05/2016	24/05/2016	24/05/2016	12/07/2016	24/05/2016
				Field ID	EWL-BH4003	BH4004A	BH4004A	BH4004	BH4004	EWL-BH4005	BH4006	BH4006	EWL-BH4007	EWL-BH4008	BH4009	BH4009	EWL-BH4010A	EWL-BH4010	EWL-BH4011A	BH4011A	EWL-BH4011
				Screen Geology	Waitemata	Basalt	Basalt	Waitemata	Waitemata	Basalt	Basalt	Basalt	Basalt	Basalt	Basalt	Basalt	Basalt	Tauranga	Basalt	Basalt	Tuff
Chemical Group	**Chem Name**	**Units**	**EQL**	ANZECC 2000 MW 90%																	
	Hexachlorobutadiene	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
SVOCs	1,2,3,4-tetrachlorobenzene	µg/L	1		<5	<5	-	<5	-	<5	<5	-	<5	<5	<5	-	<5	<5	<5	-	<5
	1,2,3,5-Tetrachlorobenzene	µg/L	1		<5	<5	-	<5	-	<5	<5	-	<5	<5	<5	-	<5	<5	<5	-	<5
	1,2,4,5-tetrachlorobenzene	µg/L	1		<5	<5	-	<5	-	<5	<5	-	<5	<5	<5	-	<5	<5	<5	-	<5
	1,3,5-Trichlorobenzene	µg/L	1		<5	<5	-	<5	-	<5	<5	-	<5	<5	<5	-	<5	<5	<5	-	<5
	1-Chloronaphthalene	µg/L	1		<5	<5	-	<5	-	<5	<5	-	<5	<5	<5	-	<5	<5	<5	-	<5
	1-naphthylamine	µg/L	1		<5	<5	-	<5	-	<5	<5	-	<5	<5	<5	-	<5	<5	<5	-	<5
	2-naphthylamine	µg/L	1		<5	<5	-	<5	-	<5	<5	-	<5	<5	<5	-	<5	<5	<5	-	<5
	2-nitroaniline	µg/L	1		<5	<5	-	<5	-	<5	<5	-	<5	<5	<5	-	<5	<5	<5	-	<5
	3,3-Dichlorobenzidine	µg/L	1		<5	<5	-	<5	-	<5	<5	-	<5	<5	<5	-	<5	<5	<5	-	<5
	4-(dimethylamino) azobenzene	µg/L	1		<5	<5	-	<5	-	<5	<5	-	<5	<5	<5	-	<5	<5	<5	-	<5
	4,6-Dinitro-2-methylphenol	µg/L	5		<30	<30	-	<30	-	<30	<30	-	<30	<30	<30	-	<30	<30	<30	-	<30
	7,12-dimethylbenz(a)anthracene	µg/L	1		<5	<5	-	<10	-	<5	<5	-	<5	<5	<5	-	<5	<5	<5	-	<5
	Aniline	µg/L	1		<5	<5	-	<5	-	<5	<5	-	<5	<5	<5	-	<5	<5	<5	-	<5
	Benzyl chloride	µg/L	1		<5	<5	-	<5	-	<5	<5	-	<5	<5	<5	-	<5	<5	<5	-	<5
	Dibenz(a,j)acridine	µg/L	1		<5	<5	-	<5	-	<5	<5	-	<5	<5	<5	-	<5	<5	<5	-	<5
	Diphenylamine	µg/L	1		<5	<5	-	<5	-	<5	<5	-	<5	<5	<5	-	<5	<5	<5	-	<5
	Hexachlorocyclopentadiene	µg/L	1		<5	<5	-	<5	-	<5	<5	-	<5	<5	<5	-	<5	<5	<5	-	<5
	N-nitrosodi-n-butylamine	µg/L	1		<5	<5	-	<5	-	<5	<5	-	<5	<5	<5	-	<5	<5	<5	-	<5
	N-nitrosopiperidine	µg/L	1		<5	<5	-	<5	-	<5	<5	-	<5	<5	<5	-	<5	<5	<5	-	<5
	Pentachlorobenzene	µg/L	1		<5	<5	-	<5	-	<5	<5	-	<5	<5	<5	-	<5	<5	<5	-	<5
	Trifluralin	µg/L	1		<5	<5	-	<5	-	<5	<5	-	<5	<5	<5	-	<5	<5	<5	-	<5
	4-bromophenyl phenyl ether	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
	4-chlorophenyl phenyl ether	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
	Bis(2-chloroethoxy) methane	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
	Bis(2-chloroisopropyl) ether	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
	Dibenzofuran	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
	Hexachloroethane	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
	N-nitrosodi-n-propylamine	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
Phthalates	Bis(2-ethylhexyl) phthalate	mg/L	0.001		-	<0.005	-	<0.005	-	-	<0.005	-	-	-	<0.005	-	-	-	-	-	-
	Butyl benzyl phthalate	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
	Diethylphthalate	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
	Dimethyl phthalate	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
	Di-n-butyl phthalate	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
	Di-n-octyl phthalate	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
Chlorinated Hydrocarbons	2-chloronaphthalene	µg/L	1		<5	<5	-	<5	-	<5	<5	-	<5	<5	<5	-	<5	<5	<5	-	<5
Explosives	2,4-Dinitrotoluene	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
	2,6-dinitrotoluene	mg/L	0.001		<0.005	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	-	<0.005
	Nitrobenzene	mg/L	0.05		<0.05	<0.05	-	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	-	<0.05
Herbicides	Pronamide	µg/L	1		<5	<5	-	<5	-	<5	<5	-	<5	<5	<5	-	<5	<5	<5	-	<5
Nitroaromatics	2-Picoline	µg/L	1		<5	<5	-	<5	-	<5	<5	-	<5	<5	<5	-	<5	<5	<5	-	<5
	4-aminobiphenyl	µg/L	1		<5	<5	-	<5	-	<5	<5	-	<5	<5	<5	-	<5	<5	<5	-	<5
	Pentachloronitrobenzene	µg/L	1		<5	<5	-	<5	-	<5	<5	-	<5	<5	<5	-	<5	<5	<5	-	<5

Appendix B3
Table 4
Analytical Results of the Groundwater

					Location Code	BH4012	BH5001	BH5001	BH5001	BH5002A	BH5002	BH5003	BH5003	BH5004	BH5004	BH5005A	BH5005A	BH5005	BH5005	BH5006	BH5006	BH5007
					Sampled Date	24/05/2016	19/05/2016	24/05/2016	6/07/2016	6/07/2016	6/07/2016	19/05/2016	6/07/2016	19/05/2016	6/07/2016	19/05/2016	6/07/2016	19/05/2016	6/07/2016	19/05/2016	6/07/2016	6/07/2016
					Field ID	EWL-BH4012	BH5001	EWL-BH5001	BH5001	BH5002A	BH5002	BH5003	BH5003	EWL BH5004	BH5004	BH5005A	BH5005A	BH5005	BH5005	BH5006	BH5006	BH5007
					Screen Geology	Tauranga	FILL	FILL	FILL	FILL	Basalt	FILL	FILL	FILL	FILL	FILL	FILL	Basalt	Basalt	Basalt	Basalt	FILL
Chemical Group	**Chem Name**	**Units**	**EQL**	ANZECC 2000 MW 90%																		
Field	ORP	mV			-116	-23.2	-	57.8	-89.7	-98	-70.4	-40.2	-75.9	-17.7	-68.8	-10.7	12.9	50.3	-51.6	61	-60.5
	SP Conductivity	µS/cm			530.1	1510	-	1415	10,620	19,570	1099	813	3830	3231	1113	961	2186	1043	7.12	509.8	2912
	Dissolved Oxygen (Field) %	%			-	-	-	33.5	9.6	24.9	-	22.3	-	38.3	-	34.7	-	27	-	37.4	7.3
	Dissolved Oxygen (Field) % (Filtered)	%			10.4	6.4	-	-	-	-	1.2	-	8	-	12.1	-	15.1	-	8.7	-	-
	Dissolved Oxygen (Field)	mg/L			-	-	-	3.1	0.88	2.16	-	2.06	-	3.59	-	3.38	-	2.65	-	3.77	0.7
	Dissolved Oxygen (Field) (Filtered)	mg/L			1.04	0.6	-	-	-	-	0.11	-	0.72	-	1.09	-	1.41	-	0.83	-	-
	Temp (Field)	oC			14.8	18.5	-	17.6	17.9	17.8	20.9	18.8	18.9	16.3	20	16.2	18.4	17.1	17.2	15.3	17.3
	pH (Field)	pH_Units			7.94	6.95	-	7.04	7.49	7.44	6.63	6.78	7.96	7.33	6.69	6.83	7	6.97	7.58	6.53	6.64
	Electrical Conductivity (Field)	uS/cm			426.7	1323	-	1213	9181	16,870	1014	716	3393	2692	1006	799	1911	897	605	414.6	2479
Metals	Aluminium (Filtered)	mg/L	0.05		-	-	-	0.15	0.08	<0.05	-	3.4	-	0.12	-	1.1	-	5.7	-	12	<0.05
	Antimony (Filtered)	mg/L	0.005		-	-	-	<0.005	0.014	<0.005	-	<0.005	-	4.4	-	<0.005	-	<0.005	-	<0.005	<0.005
	Arsenic	mg/L	0.001		-	0.011	-	-	-	-	0.017	-	0.75	-	0.005	-	0.001	-	0.003	-	-
	Arsenic (Filtered)	mg/L	0.001		0.011	-	<0.01	<0.001	0.008	<0.001	-	0.003	-	0.092	-	0.009	-	0.002	-	0.001	0.004
	Barium (Filtered)	mg/L	0.02		-	-	-	0.11	0.18	0.05	-	0.57	-	0.13	-	0.21	-	0.32	-	0.11	0.21
	Beryllium	mg/L	0.001		-	<0.001	-	-	-	-	<0.001	-	0.01	-	<0.001	-	<0.001	-	<0.001	-	-
	Beryllium (Filtered)	mg/L	0.001		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Boron	mg/L	0.05		-	1.4	-	-	-	-	0.51	-	5.7	-	0.7	-	0.51	-	0.09	-	-
	Boron (Filtered)	mg/L	0.05		-	-	-	1	3.4	3.2	-	0.28	-	3.6	-	0.42	-	0.13	-	<0.05	0.69
	Cadmium	mg/L	0.0002	0.014	-	0.0002	-	-	-	-	0.0013	-	0.0019	-	<0.0002	-	0.0003	-	<0.0002	-	-
	Cadmium (Filtered)	mg/L	0.0002	0.014	<0.0002	-	<0.002	<0.0002	<0.0002	<0.0002	-	<0.0002	-	<0.0002	-	<0.0002	-	0.0026	-	<0.0002	<0.0002
	Chromium (hexavalent)	mg/L	0.001	0.02	-	<0.001	-	-	-	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	-
	Chromium (III+VI) (Filtered)	mg/L	0.001	0.02	<0.001	-	<0.01	<0.001	<0.001	<0.001	-	0.022	-	<0.001	-	<0.001	-	0.003	-	0.005	<0.001
	Cobalt	mg/L	0.001	0.014	-	0.032	-	-	-	-	0.016	-	0.16	-	0.004	-	0.006	-	0.011	-	-
	Cobalt (Filtered)	mg/L	0.001	0.014	-	-	-	0.004	0.002	<0.001	-	0.01	-	0.006	-	0.004	-	0.042	-	0.01	0.014
	Copper	mg/L	0.001	0.003	-	0.092	-	-	-	-	0.13	-	0.48	-	0.008	-	0.037	-	0.044	-	-
	Copper (Filtered)	mg/L	0.001	0.003	<0.001	-	<0.01	0.016	<0.001	<0.001	-	<0.001	-	0.035	-	0.01	-	0.25	-	0.042	<0.001
	Iron (Filtered)	mg/L	0.05		-	-	-	<0.05	1.8	1.3	-	42	-	0.76	-	14	-	39	-	6.6	23
	Lead	mg/L	0.001	0.0066	-	0.036	-	-	-	-	0.14	-	0.39	-	0.01	-	0.001	-	0.002	-	-
	Lead (Filtered)	mg/L	0.001	0.0066	<0.001	-	<0.01	<0.001	0.001	<0.001	-	0.014	-	0.008	-	0.012	-	<0.001	-	0.001	<0.001
	Lithium (Filtered)	mg/L	0.005		-	-	-	0.0096	0.022	0.027	-	0.0052	-	0.0057	-	0.0051	-	0.0089	-	0.0033	0.026
	Manganese	mg/L	0.005		-	2.6	-	-	-	-	0.77	-	7.1	-	0.97	-	0.64	-	0.7	-	-
	Manganese (Filtered)	mg/L	0.005		-	-	-	0.58	0.43	0.33	-	0.96	-	0.98	-	1	-	1.5	-	0.4	2.9
	Mercury	mg/L	0.0001	0.0007	-	0.0003	-	-	-	-	0.0002	-	0.0012	-	<0.0001	-	0.0001	-	0.0001	-	-
	Mercury (Filtered)	mg/L	0.0001	0.0007	<0.0001	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Molybdenum (Filtered)	mg/L	0.005		-	-	-	<0.005	0.006	0.007	-	<0.005	-	0.042	-	<0.005	-	<0.005	-	<0.005	<0.005
	Nickel	mg/L	0.001	0.2	-	0.066	-	-	-	-	0.067	-	0.39	-	0.007	-	0.012	-	0.037	-	-
	Nickel (Filtered)	mg/L	0.001	0.2	0.011	-	<0.01	0.009	0.007	0.002	-	0.027	-	0.019	-	0.011	-	0.1	-	0.014	0.021
	Selenium	mg/L	0.001		-	0.002	-	-	-	-	<0.001	-	0.014	-	<0.001	-	<0.001	-	0.001	-	-
	Selenium (Filtered)	mg/L	0.001		-	-	-	<0.001	<0.001	<0.001	-	0.002	-	0.004	-	<0.001	-	0.001	-	0.001	<0.001
	Silver (Filtered)	mg/L	0.005	0.0018	-	-	-	<0.005	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	<0.005	-	<0.005	<0.005
	Strontium (Filtered)	mg/L	0.005		-	-	-	1.1	0.85	1.9	-	0.61	-	0.98	-	0.82	-	0.38	-	0.12	1.6
	Thallium (Filtered)	mg/L	0.001		-	-	-	<0.001	<0.001	<0.001	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	<0.001	<0.001
	Tin (Filtered)	mg/L	0.005		-	-	-	<0.005	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	<0.005	-	<0.005	<0.005
	Uranium (Filtered)	mg/L	0.005		-	-	-	<0.005	<0.005	<0.005	-	<0.005	-	<0.005	-	<0.005	-	<0.005	-	<0.005	<0.005
	Vanadium (Filtered)	mg/L	0.005	0.16	-	-	-	<0.005	<0.005	<0.005	-	0.019	-	0.019	-	0.009	-	0.066	-	0.022	<0.005
	Zinc	mg/L	0.005	0.023	-	0.16	-	-	-	-	0.73	-	0.69	-	0.041	-	0.017	-	0.032	-	-
	Zinc (Filtered)	mg/L	0.001	0.023	0.018	-	0.017	0.046	0.014	0.004	-	0.68	-	0.04	-	0.12	-	0.18	-	0.26	0.01
TPH	C7-C9	mg/L	0.1		<0.1	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	-	0.1	-	<0.1	<0.1
	C10 - C14	mg/L	0.05		0.3	<0.05	<0.2	<0.2	<0.2	<0.2	<0.05	<0.2	<0.2	<0.2	1.1	<0.2	<0.05	<0.2	<0.05	<0.2	0.5
	C15-C36	mg/L	0.4		<0.4	-	<0.4	<0.4	<0.4	<0.4	-	<0.4	<0.4	<0.4	-	<0.4	-	<0.4	-	<0.4	1.6
	C7-C36	mg/L	0.7		<0.7	-	<0.7	<0.7	<0.7	<0.7	-	<0.7	<0.7	<0.7	-	<0.7	-	<0.7	-	<0.7	2.1
BTEX & MAH	Benzene	mg/L	0.001	0.9	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	BTEX (Sum of Total) - Calc	µg/L			<6	<6	4.5	<6	<6	<6	<6	<6	-	<6	<6	<6	<6	<6	<6	<6	<6
	Ethylbenzene	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Toluene	mg/L	0.001		<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Xylene (o)	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Xylene (m & p)	mg/L	0.002		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
	Xylene Total	µg/L	3		<3	<3	<3	<3	<3	<3	<3	<3	-	<3	<3	<3	<3	<3	<3	<3	<3
	Xylenes (Sum of Total) - Calc	µg/L			<1	<1	<1	<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1	<1	<1	<1
PAH	PAHs (Sum of Total) - Calc	µg/L			<21	<21	<21	-	-	-	<21	-	<36	-	<21	-	<21	-	<21	-	-
	Benzo[b+j]fluoranthene	mg/L	0.001		<0.001	<0.001	<0.001	-	-	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	-
	Pyrene	mg/L	0.001		<0.001	<0.001	<0.001	-	-	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	-
	Carcinogenic PAHs (as B(a)P TEQ) - Calc	µg/L			<2.42	<2.42	<2.42	-	-	-	<2.42	-	<2.42	-	<2.42	-	<2.42	-	<2.42	-	-
	Acenaphthene	mg/L	0.001		<0.001	<0.001	<0.001	-	-	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	-
	Acenaphthylene	mg/L	0.001		<0.001	<0.001	<0.001	-	-	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	-
	Anthracene	mg/L	0.001		<0.001	<0.001	<0.001	-	-	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	-
	Benz(a)anthracene	mg/L	0.001		<0.001	<0.001	<0.001	-	-	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	-
	Benzo(a) pyrene	mg/L	0.001		<0.001	<0.001	<0.001	-	-	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	-
	Benzo(k)fluoranthene	mg/L	0.001		<0.001	<0.001	<0.001	-	-	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	-
	Benzo(g,h,i)perylene	mg/L	0.001		<0.001	<0.001	<0.001	-	-	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	-
	Chrysene	mg/L	0.001		<0.001	<0.001	<0.001	-	-	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	-
	Dibenz(a,h)anthracene	mg/L	0.001		<0.001	<0.001	<0.001	-	-	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	-
	Fluoranthene	mg/L	0.001		<0.001	<0.001	<0.001	-	-	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	-

Appendix B3
Table 4
Analytical Results of the Groundwater

				Location Code	BH4012	BH5001	BH5001	BH5001	BH5002A	BH5002	BH5003	BH5003	BH5004	BH5004	BH5005A	BH5005A	BH5005	BH5005	BH5006	BH5006	BH5007
				Sampled Date	24/05/2016	19/05/2016	24/05/2016	6/07/2016	6/07/2016	6/07/2016	19/05/2016	6/07/2016	19/05/2016	6/07/2016	19/05/2016	6/07/2016	19/05/2016	6/07/2016	19/05/2016	6/07/2016	6/07/2016
				Field ID	EWL-BH4012	BH5001	EWL-BH5001	BH5001	BH5002A	BH5002	BH5003	BH5003	EWL BH5004	BH5004	BH5005A	BH5005A	BH5005	BH5005	BH5006	BH5006	BH5007
				Screen Geology	Tauranga	FILL	FILL	FILL	FILL	Basalt	FILL	FILL	FILL	FILL	FILL	FILL	Basalt	Basalt	Basalt	Basalt	FILL
Chemical Group	Chem Name	Units	EQL	ANZECC 2000 MW 90%																	
	Fluorene	mg/L	0.001		<0.001	<0.001	<0.001	-	-	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	-
	Indeno(1,2,3-c,d)pyrene	mg/L	0.001		<0.001	<0.001	<0.001	-	-	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	-
	Naphthalene	mg/L	0.001	0.09	<0.001	<0.001	<0.001	-	-	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	-
	Phenanthrene	mg/L	0.001		<0.001	<0.001	<0.001	-	-	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	<0.001	-	-
Miscellaneous	TOC	mg/L	5		-	20	-	-	-	-	11	-	120	-	<5	-	7	-	<5	-	-
	Total Dissolved Solids	mg/L	10		-	950	-	-	-	-	580	-	-	-	560	-	1200	-	380	-	-
	Electrical conductivity *(lab)	mS/m	0.1		-	130	-	-	-	-	95	-	-	-	90	-	170	-	67	-	-
	pH (Lab)	pH_Units	0.1		-	7.4	-	-	-	-	6.8	-	-	-	6.8	-	7.3	-	7.2	-	-
Nutrients	Nitrogen (Organic)	µg/L	200		<200	500	1300	1000	1200	600	<200	700	-	2200	1800	600	<200	500	<200	400	3000
	Ammonia as N	mg/L	0.01	1.2	0.55	1.9	3.5	0.69	4.1	3.6	5.5	4.7	9.9	4.8	7.5	3.6	1.4	0.38	0.14	0.05	14
	Nitrate (as N)	mg/L	0.02		0.02	0.13	<0.02	5	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.03	<0.02	0.51	0.03
	Nitrite (as N)	mg/L	0.02		<0.02	0.05	<0.02	0.1	<0.02	<0.02	<0.02	<0.02	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.04	<0.02
	Nitrogen (Total)	mg/L	0.05		0.5	2.6	4.8	5.1 - 6.8	<0.05 - 5.3	<0.05 - 4.2	5.6	<0.05 - 5.4	-	<0.05 - 7	9.3	<0.05 - 4.2	1.4	<0.05 - 0.9	<0.2	0.55 - 1.1	<0.05 - 17
	Phosphate total (P)	mg/L	0.01		0.33	0.16	0.73	-	-	-	1	-	-	-	0.08	-	0.35	-	0.88	-	-
	Sulphate as S	mg/L	5		<5	17	210	39	84	180	<5	<5	60	120	<5	16	27	13	14	9.9	21
	Nitrate-N + Nitrite-N	mg/L	0.05		<0.05	0.18	<0.05	-	-	-	<0.05	-	-	-	<0.05	-	<0.05	-	<0.05	-	-
	Kjeldahl Nitrogen Total	mg/L	0.2		0.5	2.4	4.8	1.7	5.3	4.2	5.6	5.4	-	7	9.3	4.2	1.4	0.9	<0.2	0.5	17
Alkalinity	Alkalinity (total) as CaCO3	mg/L	20		300	920	1400	-	-	-	440	-	2200	-	570	-	380	-	190	-	-
	Alkalinity (Bicarbonate as CaCO3)	mg/L	20		300	920	1400	640	1400	1400	440	330	2200	1300	570	430	380	130	190	150	1200
	Alkalinity (Hydroxide) as CaCO3	mg/L	10		<10	-	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Carbonate Alkalinity (as CaCO3)	mg/L	10		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Major Ions	Calcium	mg/L	0.5		130	170	120	180	71	120	89	89	81	110	86	93	20	37	18	35	110
	Chloride	mg/L	1		46	82	5900	54	2800	5800	130	52	360	240	60	54	430	120	120	64	480
	Magnesium	mg/L	0.5		19	40	340	37	140	340	23	19	31	48	33	29	52	60	33	29	67
	Potassium	mg/L	0.5		8	21	140	20	88	130	11	9.2	140	220	15	10	12	11	5.4	1.6	35
	Sodium	mg/L	0.5		130	150	3600	110	1900	3500	99	54	840	460	80	73	270	110	89	41	610
OC Pesticides	Aldrin + Dieldrin - Calc	µg/L			<10	<10	<10	-	-	-	<10	-	<40	-	<10	-	<10	-	<10	-	-
	OCPs (Sum of Total) - Calc	µg/L			<95	<90	<105	-	-	-	<90	-	<360	-	<90	-	<90	-	<90	-	-
	4,4 DDD	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
	4,4 DDE	mg/L	0.001		<0.01	<0.005	<0.02	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
	4,4 DDT	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
	a-BHC	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
	Aldrin	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
	b-BHC	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
	d-BHC	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
	DDT + DDD + DDE - Calc	mg/L			<0.02	<0.015	<0.03	-	-	-	<0.015	-	<0.06	-	<0.015	-	<0.015	-	<0.015	-	-
	Dieldrin	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
	Endosulfan I	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
	Endosulfan II	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
	Endosulfan sulphate	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
	Endrin	mg/L	0.001	0.00001	<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
	Endrin aldehyde	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
	Endrin ketone	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
	g-BHC (Lindane)	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
	Heptachlor	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
	Heptachlor epoxide	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
	Hexachlorobenzene	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
	Methoxychlor	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
Phenols	2,3,4,6-tetrachlorophenol	µg/L	10		<10	<10	<10	-	-	-	<10	-	<20	-	<10	-	<10	-	<10	-	-
	2,4-dinitrophenol	µg/L	1		<30	<30	<30	-	-	-	<30	-	<30	-	<30	-	<30	-	<30	-	-
	2,6-dichlorophenol	µg/L	3		<3	<3	<3	-	-	-	<3	-	<3	-	<3	-	<3	-	<3	-	-
	3-methylcholanthrene	µg/L	1		<5	<5	<5	-	-	-	<5	-	<20	-	<5	-	<5	-	<5	-	-
	4-nitrophenol	µg/L	1		<30	<30	<30	-	-	-	<30	-	<30	-	<30	-	<30	-	<30	-	-
	Acetophenone	µg/L	1		<5	<5	<5	-	-	-	<5	-	<20	-	<5	-	<5	-	<5	-	-
	Phenols (Sum of Total) - Calc	µg/L			<168	<168	<168	-	-	-	<168	-	<178	-	<168	-	<168	-	<168	-	-
	2,4,5-trichlorophenol	mg/L	0.001		<0.01	<0.01	<0.01	-	-	-	<0.01	-	<0.01	-	<0.01	-	<0.01	-	<0.01	-	-
	2,4,6-trichlorophenol	mg/L	0.01		<0.01	<0.01	<0.01	-	-	-	<0.01	-	<0.01	-	<0.01	-	<0.01	-	<0.01	-	-
	2,4-dichlorophenol	mg/L	0.001		<0.003	<0.003	<0.003	-	-	-	<0.003	-	<0.003	-	<0.003	-	<0.003	-	<0.003	-	-
	2,4-dimethylphenol	mg/L	0.001		<0.003	<0.003	<0.003	-	-	-	<0.003	-	<0.003	-	<0.003	-	<0.003	-	<0.003	-	-
	2-chlorophenol	mg/L	0.003		<0.003	<0.003	<0.003	-	-	-	<0.003	-	<0.003	-	<0.003	-	<0.003	-	<0.003	-	-
	2-methylnaphthalene	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
	2-methylphenol	mg/L	0.003		<0.003	<0.003	<0.003	-	-	-	<0.003	-	<0.003	-	<0.003	-	<0.003	-	<0.003	-	-
	2-nitrophenol	mg/L	0.005		<0.01	<0.01	<0.01	-	-	-	<0.01	-	<0.01	-	<0.01	-	<0.01	-	<0.01	-	-
	3-&4-methylphenol	mg/L	0.006		<0.006	<0.006	<0.006	-	-	-	<0.006	-	<0.006	-	<0.006	-	<0.006	-	<0.006	-	-
	4-chloro-3-methylphenol	mg/L	0.01		<0.01	<0.01	<0.01	-	-	-	<0.01	-	<0.01	-	<0.01	-	<0.01	-	<0.01	-	-
	Pentachlorophenol	mg/L	0.01	0.033	<0.01	<0.01	<0.01	-	-	-	<0.01	-	<0.01	-	<0.01	-	<0.01	-	<0.01	-	-
	Phenol	mg/L	0.003	0.52	<0.003	<0.003	<0.003	-	-	-	<0.003	-	<0.003	-	<0.003	-	<0.003	-	<0.003	-	-
VOCs	1,2,3-trichlorobenzene	µg/L	1		<5	<5	<5	-	-	-	<5	-	<20	-	<5	-	<5	-	<5	-	-
	Formaldehyde	µg/L	200		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1,2,4-trichlorobenzene	mg/L	0.001	0.14	<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
	1,2-dichlorobenzene	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
	1,3-dichlorobenzene	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
	1,4-dichlorobenzene	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-

Appendix B3
Table 4
Analytical Results of the Groundwater

				Location Code	BH4012	BH5001	BH5001	BH5001	BH5002A	BH5002	BH5003	BH5003	BH5004	BH5004	BH5005A	BH5005A	BH5005	BH5005	BH5006	BH5006	BH5007
				Sampled Date	24/05/2016	19/05/2016	24/05/2016	6/07/2016	6/07/2016	6/07/2016	19/05/2016	6/07/2016	19/05/2016	6/07/2016	19/05/2016	6/07/2016	19/05/2016	6/07/2016	19/05/2016	6/07/2016	6/07/2016
				Field ID	EWL-BH4012	BH5001	EWL-BH5001	BH5001	BH5002A	BH5002	BH5003	BH5003	EWL BH5004	BH5004	BH5005A	BH5005A	BH5005	BH5005	BH5006	BH5006	BH5007
				Screen Geology	Tauranga	FILL	FILL	FILL	FILL	Basalt	FILL	FILL	FILL	FILL	FILL	FILL	Basalt	Basalt	Basalt	Basalt	FILL
				ANZECC 2000 MW																	
Chemical Group	**Chem Name**	**Units**	**EQL**	90%																	
	Hexachlorobutadiene	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
SVOCs	1,2,3,4-tetrachlorobenzene	µg/L	1		<5	<5	<5	-	-	-	<5	-	<20	-	<5	-	<5	-	<5	-	-
	1,2,3,5-Tetrachlorobenzene	µg/L	1		<5	<5	<5	-	-	-	<5	-	<20	-	<5	-	<5	-	<5	-	-
	1,2,4,5-tetrachlorobenzene	µg/L	1		<5	<5	<5	-	-	-	<5	-	<20	-	<5	-	<5	-	<5	-	-
	1,3,5-Trichlorobenzene	µg/L	1		<5	<5	<5	-	-	-	<5	-	<20	-	<5	-	<5	-	<5	-	-
	1-Chloronaphthalene	µg/L	1		<5	<5	<5	-	-	-	<5	-	<20	-	<5	-	<5	-	<5	-	-
	1-naphthylamine	µg/L	1		<5	<5	<5	-	-	-	<5	-	<20	-	<5	-	<5	-	<5	-	-
	2-naphthylamine	µg/L	1		<5	<5	<5	-	-	-	<5	-	<20	-	<5	-	<5	-	<5	-	-
	2-nitroaniline	µg/L	1		<5	<5	<5	-	-	-	<5	-	<20	-	<5	-	<5	-	<5	-	-
	3,3-Dichlorobenzidine	µg/L	1		<5	<5	<5	-	-	-	<5	-	<20	-	<5	-	<5	-	<5	-	-
	4-(dimethylamino) azobenzene	µg/L	1		<5	<5	<5	-	-	-	<5	-	<20	-	<5	-	<5	-	<5	-	-
	4,6-Dinitro-2-methylphenol	µg/L	5		<30	<30	<30	-	-	-	<30	-	<30	-	<30	-	<30	-	<30	-	-
	7,12-dimethylbenz(a)anthracene	µg/L	1		<5	<5	<5	-	-	-	<5	-	<20	-	<5	-	<5	-	<5	-	-
	Aniline	µg/L	1		<5	<5	<5	-	-	-	<5	-	<20	-	<5	-	<5	-	<5	-	-
	Benzyl chloride	µg/L	1		<5	<5	<5	-	-	-	<5	-	<20	-	<5	-	<5	-	<5	-	-
	Dibenz(a,j)acridine	µg/L	1		<5	<5	<5	-	-	-	<5	-	<20	-	<5	-	<5	-	<5	-	-
	Diphenylamine	µg/L	1		<5	<5	<5	-	-	-	<5	-	<20	-	<5	-	<5	-	<5	-	-
	Hexachlorocyclopentadiene	µg/L	1		<5	<5	<5	-	-	-	<5	-	<20	-	<5	-	<5	-	<5	-	-
	N-nitrosodi-n-butylamine	µg/L	1		<5	<5	<5	-	-	-	<5	-	<20	-	<5	-	<5	-	<5	-	-
	N-nitrosopiperidine	µg/L	1		<5	<5	<5	-	-	-	<5	-	<20	-	<5	-	<5	-	<5	-	-
	Pentachlorobenzene	µg/L	1		<5	<5	<5	-	-	-	<5	-	<20	-	<5	-	<5	-	<5	-	-
	Trifluralin	µg/L	1		<5	<5	<5	-	-	-	<5	-	<20	-	<5	-	<5	-	<5	-	-
	4-bromophenyl phenyl ether	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
	4-chlorophenyl phenyl ether	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
	Bis(2-chloroethoxy) methane	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
	Bis(2-chloroisopropyl) ether	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
	Dibenzofuran	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
	Hexachloroethane	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
	N-nitrosodi-n-propylamine	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
Phthalates	Bis(2-ethylhexyl) phthalate	mg/L	0.001		-	0.01	-	-	-	-	0.008	-	-	-	0.006	-	<0.005	-	0.013	-	-
	Butyl benzyl phthalate	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
	Diethylphthalate	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
	Dimethyl phthalate	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
	Di-n-butyl phthalate	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
	Di-n-octyl phthalate	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
Chlorinated Hydrocarbons	2-chloronaphthalene	µg/L	1		<5	<5	<5	-	-	-	<5	-	<20	-	<5	-	<5	-	<5	-	-
Explosives	2,4-Dinitrotoluene	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
	2,6-dinitrotoluene	mg/L	0.001		<0.005	<0.005	<0.005	-	-	-	<0.005	-	<0.02	-	<0.005	-	<0.005	-	<0.005	-	-
	Nitrobenzene	mg/L	0.05		<0.05	<0.05	<0.05	-	-	-	<0.05	-	<0.05	-	<0.05	-	<0.05	-	<0.05	-	-
Herbicides	Pronamide	µg/L	1		<5	<5	<5	-	-	-	<5	-	<20	-	<5	-	<5	-	<5	-	-
Nitroaromatics	2-Picoline	µg/L	1		<5	<5	<5	-	-	-	<5	-	<20	-	<5	-	<5	-	<5	-	-
	4-aminobiphenyl	µg/L	1		<5	<5	<5	-	-	-	<5	-	<20	-	<5	-	<5	-	<5	-	-
	Pentachloronitrobenzene	µg/L	1		<5	<5	<5	-	-	-	<5	-	<20	-	<5	-	<5	-	<5	-	-

Appendix B3
Table 4
Analytical Results of the Groundwater

				Location Code	BH5008A	BH5008	BH5002(DUP_1)	BH1HA	BH1HB	BH1HB	PP_BH1	PP_BH1A	PP_BH2	PP_BH2A	PP_BH4	WAIKARAKA_EAST_N	WAIKARAKA_EAST_S	WAIKARAKA_WEST
				Sampled Date	20/05/2016	20/05/2016	6/07/2016	14/07/2016	20/05/2016	14/07/2016	14/07/2016	14/07/2016	14/07/2016	14/07/2016	14/07/2016	13/07/2016	13/07/2016	13/07/2016
				Field ID	BH5008A	BH5008	GW_DUPE_1	BH1HA	BH1HB	BH1HB	PP_BH1	PP_BH1A	PP_BH2	PP_BH2A	PP_BH4	WAIKARAKA_EAST_N	WAIKARAKA_EAST_S	WAIKARAKA_WEST
				Screen Geology	FILL	Basalt	Basalt	Unknown	Unknown	Unknown	Uknown	Uknown	Uknown	Uknown	Uknown	Uknown	Uknown	Uknown
Chemical Group	**Chem Name**	**Units**	**EQL**	ANZECC 2000 MW 90%														
Field	ORP	mV			-	-8.59	-	-81.7	-75.9	-43.3	-38	-41.5	-89.1	-39.6	-28	-37.3	50.6	-53.6
	SP Conductivity	µS/cm			-	2176	-	15,220	2554	2171	22,630	2041	30,860	2736	6064	845	1266	1390
	Dissolved Oxygen (Field) %	%			-	-	-	9.1	-	35.9	35.5	21.6	7.4	24.8	48.3	52.3	49.3	29.9
	Dissolved Oxygen (Field) % (Filtered)	%			-	10.8	-	-	0.2	-	-	-	-	-	-	-	-	-
	Dissolved Oxygen (Field)	mg/L			-	-	-	0.92	-	3.41	3.04	1.93	0.62	2.26	4.45	5.02	4.91	2.86
	Dissolved Oxygen (Field) (Filtered)	mg/L			-	1.03	-	-	0.02	-	-	-	-	-	-	-	-	-
	Temp (Field)	oC			-	16.8	-	15.8	19.4	17.4	18.4	20.4	18.7	19.2	17.1	16.6	15.2	17.5
	pH (Field)	pH_Units			-	7.41	-	7.33	6.69	6.81	7.06	6.58	7.12	6.69	6.82	7.02	7.01	6.72
	Electrical Conductivity (Field)	uS/cm			-	1833	-	12,690	2282	1854	19,750	1862	27,070	2431	5140	708	1029	1191
Metals	Aluminium (Filtered)	mg/L	0.05		-	-	0.06	-	-	-	-	-	-	-	-	-	-	-
	Antimony (Filtered)	mg/L	0.005		-	-	0.022	-	-	-	-	-	-	-	-	-	-	-
	Arsenic	mg/L	0.001		-	0.003	-	-	0.21	-	-	-	-	-	-	-	-	-
	Arsenic (Filtered)	mg/L	0.001		-	-	0.006	0.015	-	0.004	<0.005	0.002	<0.005	0.002	0.003	0.01	<0.001	0.006
	Barium (Filtered)	mg/L	0.02		-	-	0.18	-	-	-	-	-	-	-	-	-	-	-
	Beryllium	mg/L	0.001		-	<0.001	-	-	0.002	-	-	-	-	-	-	-	-	-
	Beryllium (Filtered)	mg/L	0.001		-	-	-	<0.001	-	<0.001	<0.005	<0.001	<0.005	<0.001	<0.001	-	-	-
	Boron	mg/L	0.05		-	1.5	-	-	6.2	-	-	-	-	-	-	-	-	-
	Boron (Filtered)	mg/L	0.05		-	-	3.4	5.9	-	4.3	2.8	2.4	5.9	3.9	2.6	-	-	-
	Cadmium	mg/L	0.0002	0.014	-	<0.0002	-	-	0.0091	-	-	-	-	-	-	-	-	-
	Cadmium (Filtered)	mg/L	0.0002	0.014	-	-	<0.0002	<0.0002	-	<0.0002	<0.001	<0.0002	<0.001	<0.0002	<0.0002	0.0015	0.0004	0.0005
	Chromium (hexavalent)	mg/L	0.001	0.02	-	<0.001	-	<0.001	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-
	Chromium (III+VI) (Filtered)	mg/L	0.001	0.02	-	-	<0.001	-	-	-	-	-	-	-	-	<0.001	<0.001	<0.001
	Cobalt	mg/L	0.001	0.014	-	0.004	-	-	0.065	-	-	-	-	-	-	-	-	-
	Cobalt (Filtered)	mg/L	0.001	0.014	-	-	0.002	0.006	-	0.002	<0.005	0.002	<0.005	0.004	0.003	-	-	-
	Copper	mg/L	0.001	0.003	-	0.059	-	-	0.71	-	-	-	-	-	-	-	-	-
	Copper (Filtered)	mg/L	0.001	0.003	-	-	<0.001	<0.001	-	<0.001	<0.005	<0.001	<0.005	<0.001	<0.001	0.046	0.02	0.008
	Iron (Filtered)	mg/L	0.05		-	-	1.2	-	-	-	-	-	-	-	-	-	-	-
	Lead	mg/L	0.001	0.0066	-	0.006	-	-	1.9	-	-	-	-	-	-	-	-	-
	Lead (Filtered)	mg/L	0.001	0.0066	-	-	0.005	<0.001	-	<0.001	<0.005	<0.001	<0.005	<0.001	<0.001	0.029	<0.001	0.002
	Lithium (Filtered)	mg/L	0.005		-	-	0.025	-	-	-	-	-	-	-	-	-	-	-
	Manganese	mg/L	0.005		-	0.57	-	-	1.5	-	-	-	-	-	-	-	-	-
	Manganese (Filtered)	mg/L	0.005		-	-	0.42	0.97	-	0.6	1.3	0.72	2.1	0.43	0.59	-	-	-
	Mercury	mg/L	0.0001	0.0007	-	<0.0001	-	-	0.001	-	-	-	-	-	-	-	-	-
	Mercury (Filtered)	mg/L	0.0001	0.0007	-	-	-	<0.0001	-	<0.0001	<0.0005	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Molybdenum (Filtered)	mg/L	0.005		-	-	0.007	-	-	-	-	-	-	-	-	-	-	-
	Nickel	mg/L	0.001	0.2	-	0.03	-	-	0.28	-	-	-	-	-	-	-	-	-
	Nickel (Filtered)	mg/L	0.001	0.2	-	-	0.006	0.015	-	0.009	<0.005	0.004	0.011	0.009	0.008	0.011	0.01	0.023
	Selenium	mg/L	0.001		-	<0.001	-	-	0.005	-	-	-	-	-	-	-	-	-
	Selenium (Filtered)	mg/L	0.001		-	-	<0.001	<0.001	-	<0.001	<0.005	<0.001	<0.005	<0.001	<0.001	-	-	-
	Silver (Filtered)	mg/L	0.005	0.0018	-	-	<0.005	-	-	-	-	-	-	-	-	-	-	-
	Strontium (Filtered)	mg/L	0.005		-	-	0.92	-	-	-	-	-	-	-	-	-	-	-
	Thallium (Filtered)	mg/L	0.001		-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-
	Tin (Filtered)	mg/L	0.005		-	-	<0.005	-	-	-	-	-	-	-	-	-	-	-
	Uranium (Filtered)	mg/L	0.005		-	-	<0.005	-	-	-	-	-	-	-	-	-	-	-
	Vanadium (Filtered)	mg/L	0.005	0.16	-	-	<0.005	-	-	-	-	-	-	-	-	-	-	-
	Zinc	mg/L	0.005	0.023	-	0.044	-	-	4.6	-	-	-	-	-	-	-	-	-
	Zinc (Filtered)	mg/L	0.001	0.023	-	-	0.016	0.038	-	0.023	0.01	0.011	0.01	0.029	0.011	0.41	0.16	0.61
TPH	C7-C9	mg/L	0.1		-	-	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	C10 - C14	mg/L	0.05		-	0.06	<0.2	<0.2	<0.05	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	C15-C36	mg/L	0.4		-	-	<0.4	<0.4	-	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
	C7-C36	mg/L	0.7		-	-	<0.7	<0.7	-	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7
BTEX & MAH	Benzene	mg/L	0.001	0.9	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	BTEX (Sum of Total) - Calc	µg/L			<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6
	Ethylbenzene	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Toluene	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Xylene (o)	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Xylene (m & p)	mg/L	0.002		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
	Xylene Total	µg/L	3		<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
	Xylenes (Sum of Total) - Calc	µg/L			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PAH	PAHs (Sum of Total) - Calc	µg/L			<10	<21	-	-	<21	-	-	-	-	-	-	-	-	-
	Benzo[b+j]fluoranthene	mg/L	0.001		-	<0.001	-	-	<0.001	-	-	-	-	-	-	-	-	-
	Pyrene	mg/L	0.001		-	<0.001	-	-	<0.001	-	-	-	-	-	-	-	-	-
	Carcinogenic PAHs (as B(a)P TEQ) - Calc	µg/L			-	<2.42	-	-	<2.42	-	-	-	-	-	-	-	-	-
	Acenaphthene	mg/L	0.001		-	<0.001	-	-	<0.001	-	-	-	-	-	-	-	-	-
	Acenaphthylene	mg/L	0.001		-	<0.001	-	-	<0.001	-	-	-	-	-	-	-	-	-
	Anthracene	mg/L	0.001		-	<0.001	-	-	<0.001	-	-	-	-	-	-	-	-	-
	Benz(a)anthracene	mg/L	0.001		-	<0.001	-	-	<0.001	-	-	-	-	-	-	-	-	-
	Benzo(a) pyrene	mg/L	0.001		-	<0.001	-	-	<0.001	-	-	-	-	-	-	-	-	-
	Benzo(k)fluoranthene	mg/L	0.001		-	<0.001	-	-	<0.001	-	-	-	-	-	-	-	-	-
	Benzo(g,h,i)perylene	mg/L	0.001		-	<0.001	-	-	<0.001	-	-	-	-	-	-	-	-	-
	Chrysene	mg/L	0.001		-	<0.001	-	-	<0.001	-	-	-	-	-	-	-	-	-
	Dibenz(a,h)anthracene	mg/L	0.001		-	<0.001	-	-	<0.001	-	-	-	-	-	-	-	-	-
	Fluoranthene	mg/L	0.001		-	<0.001	-	-	<0.001	-	-	-	-	-	-	-	-	-

Appendix B3
Table 4
Analytical Results of the Groundwater

				Location Code	BH5008A	BH5008	BH5002(DUP_1)	BH1HA	BH1HB	BH1HB	PP_BH1	PP_BH1A	PP_BH2	PP_BH2A	PP_BH4	WAIKARAKA_EAST_N	WAIKARAKA_EAST_S	WAIKARAKA_WEST
				Sampled Date	20/05/2016	20/05/2016	6/07/2016	14/07/2016	20/05/2016	14/07/2016	14/07/2016	14/07/2016	14/07/2016	14/07/2016	14/07/2016	13/07/2016	13/07/2016	13/07/2016
				Field ID	BH5008A	BH5008	GW_DUPE_1	BH1HA	BH1HB	BH1HB	PP_BH1	PP_BH1A	PP_BH2	PP_BH2A	PP_BH4	WAIKARAKA_EAST_N	WAIKARAKA_EAST_S	WAIKARAKA_WEST
				Screen Geology	FILL	Basalt	Basalt	Unknown	Unknown	Unknown	Uknown	Uknown	Uknown	Uknown	Uknown	Uknown	Uknown	Uknown
Chemical Group	**Chem Name**	**Units**	**EQL**	ANZECC 2000 MW 90%														
	Fluorene	mg/L	0.001		-	<0.001	-	-	<0.001	-	-	-	-	-	-	-	-	-
	Indeno(1,2,3-c,d)pyrene	mg/L	0.001		-	<0.001	-	-	<0.001	-	-	-	-	-	-	-	-	-
	Naphthalene	mg/L	0.001	0.09	<0.01	<0.001	-	-	<0.001	-	-	-	-	-	-	-	-	-
	Phenanthrene	mg/L	0.001		-	<0.001	-	-	<0.001	-	-	-	-	-	-	-	-	-
Miscellaneous	TOC	mg/L	5		-	32	-	<50	94	40	<50	54	<50	<25	<25	27	50	61
	Total Dissolved Solids	mg/L	10		-	1300	-	-	1300	-	-	-	-	-	-	-	-	-
	Electrical conductivity *(lab)	mS/m	0.1		-	180	-	-	210	-	-	-	-	-	-	-	-	-
	pH (Lab)	pH_Units	0.1		-	7.6	-	-	6.9	-	-	-	-	-	-	-	-	-
Nutrients	Nitrogen (Organic)	µg/L	200		1000	300	700	2500	<200	30,000	300	48,000	12,000	60,000	20,000	600	11,000	<200
	Ammonia as N	mg/L	0.01	1.2	17	3	4	3.7	88	15	2.5	14	16	60	15	1.7	0.42	14
	Nitrate (as N)	mg/L	0.02		0.05	<0.02	0.02	0.11	0.02	0.07	0.1	0.02	0.02	<0.02	0.09	0.02	0.04	0.08
	Nitrite (as N)	mg/L	0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Nitrogen (Total)	mg/L	0.05		18	3.3	<0.05 - 4.7	6.3	88	45	2.9	62	28	120	35	2.3	11	14
	Phosphate total (P)	mg/L	0.01		0.32	1.5	-	1	0.42	0.04	0.35	0.11	0.39	0.46	0.42	-	-	-
	Sulphate as S	mg/L	5		-	28	85	190	<5	37	260	15	340	<5	48	<5	5.4	10
	Nitrate-N + Nitrite-N	mg/L	0.05		0.05	<0.05	-	0.11	<0.05	0.07	0.11	<0.05	<0.05	<0.05	0.09	<0.05	<0.05	0.09
	Kjeldahl Nitrogen Total	mg/L	0.2		18	3.3	4.7	6.2	88	45	2.8	62	28	120	35	2.3	11	14
Alkalinity	Alkalinity (total) as CaCO3	mg/L	20		-	650	-	-	1500	-	-	-	-	-	-	-	-	-
	Alkalinity (Bicarbonate as CaCO3)	mg/L	20		-	650	1400	1100	1500	1100	580	970	1700	1200	1400	400	760	750
	Alkalinity (Hydroxide) as CaCO3	mg/L	10		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Carbonate Alkalinity (as CaCO3)	mg/L	10		-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Major Ions	Calcium	mg/L	0.5		-	20	66	110	110	110	86	140	110	100	65	41	80	120
	Chloride	mg/L	1		-	410	2600	5300	170	110	8000	110	12,000	180	1600	62	64	49
	Magnesium	mg/L	0.5		-	43	150	98	67	53	260	55	340	51	29	32	69	33
	Potassium	mg/L	0.5		-	26	89	50	92	52	86	28	130	89	16	14	20	16
	Sodium	mg/L	0.5		-	370	2000	1400	220	150	2500	90	3100	130	460	80	81	94
OC Pesticides	Aldrin + Dieldrin - Calc	µg/L			-	<10	-	-	<10	-	-	-	-	-	-	-	-	-
	OCPs (Sum of Total) - Calc	µg/L			-	<90	-	-	<95	-	-	-	-	-	-	-	-	-
	4,4 DDD	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
	4,4 DDE	mg/L	0.001		-	<0.005	-	-	<0.01	-	-	-	-	-	-	-	-	-
	4,4 DDT	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
	a-BHC	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
	Aldrin	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
	b-BHC	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
	d-BHC	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
	DDT + DDD + DDE - Calc	mg/L			-	<0.015	-	-	<0.02	-	-	-	-	-	-	-	-	-
	Dieldrin	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
	Endosulfan I	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
	Endosulfan II	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
	Endosulfan sulphate	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
	Endrin	mg/L	0.001	0.00001	-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
	Endrin aldehyde	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
	Endrin ketone	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
	g-BHC (Lindane)	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
	Heptachlor	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
	Heptachlor epoxide	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
	Hexachlorobenzene	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
	Methoxychlor	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
Phenols	2,3,4,6-tetrachlorophenol	µg/L	10		-	<10	-	-	<10	-	-	-	-	-	-	-	-	-
	2,4-dinitrophenol	µg/L	1		-	<30	-	-	<30	-	-	-	-	-	-	-	-	-
	2,6-dichlorophenol	µg/L	3		-	<3	-	-	<3	-	-	-	-	-	-	-	-	-
	3-methylcholanthrene	µg/L	1		-	<5	-	-	<5	-	-	-	-	-	-	-	-	-
	4-nitrophenol	µg/L	1		-	<30	-	-	<30	-	-	-	-	-	-	-	-	-
	Acetophenone	µg/L	1		-	<5	-	-	<5	-	-	-	-	-	-	-	-	-
	Phenols (Sum of Total) - Calc	µg/L			-	<168	-	-	<168	-	-	-	-	-	-	-	-	-
	2,4,5-trichlorophenol	mg/L	0.001		-	<0.01	-	-	<0.01	-	-	-	-	-	-	-	-	-
	2,4,6-trichlorophenol	mg/L	0.01		-	<0.01	-	-	<0.01	-	-	-	-	-	-	-	-	-
	2,4-dichlorophenol	mg/L	0.001		-	<0.003	-	-	<0.003	-	-	-	-	-	-	-	-	-
	2,4-dimethylphenol	mg/L	0.001		-	<0.003	-	-	<0.003	-	-	-	-	-	-	-	-	-
	2-chlorophenol	mg/L	0.003		-	<0.003	-	-	<0.003	-	-	-	-	-	-	-	-	-
	2-methylnaphthalene	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
	2-methylphenol	mg/L	0.003		-	<0.003	-	-	<0.003	-	-	-	-	-	-	-	-	-
	2-nitrophenol	mg/L	0.005		-	<0.01	-	-	<0.01	-	-	-	-	-	-	-	-	-
	3-&4-methylphenol	mg/L	0.006		-	<0.006	-	-	<0.006	-	-	-	-	-	-	-	-	-
	4-chloro-3-methylphenol	mg/L	0.01		-	<0.01	-	-	<0.01	-	-	-	-	-	-	-	-	-
	Pentachlorophenol	mg/L	0.01	0.033	-	<0.01	-	-	<0.01	-	-	-	-	-	-	-	-	-
	Phenol	mg/L	0.003	0.52	-	<0.003	-	-	<0.003	-	-	-	-	-	-	-	-	-
VOCs	1,2,3-trichlorobenzene	µg/L	1		-	<5	-	-	<5	-	-	-	-	-	-	-	-	-
	Formaldehyde	µg/L	200		-	-	-	-	-	-	-	-	-	-	-	<200	<200	<200
	1,2,4-trichlorobenzene	mg/L	0.001	0.14	-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
	1,2-dichlorobenzene	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
	1,3-dichlorobenzene	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
	1,4-dichlorobenzene	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-

Appendix B3
Table 4
Analytical Results of the Groundwater

				Location Code	BH5008A	BH5008	BH5002(DUP_1)	BH1HA	BH1HB	BH1HB	PP_BH1	PP_BH1A	PP_BH2	PP_BH2A	PP_BH4	WAIKARAKA_EAST_N	WAIKARAKA_EAST_S	WAIKARAKA_WEST
				Sampled Date	20/05/2016	20/05/2016	6/07/2016	14/07/2016	20/05/2016	14/07/2016	14/07/2016	14/07/2016	14/07/2016	14/07/2016	14/07/2016	13/07/2016	13/07/2016	13/07/2016
				Field ID	BH5008A	BH5008	GW_DUPE_1	BH1HA	BH1HB	BH1HB	PP_BH1	PP_BH1A	PP_BH2	PP_BH2A	PP_BH4	WAIKARAKA_EAST_N	WAIKARAKA_EAST_S	WAIKARAKA_WEST
				Screen Geology	FILL	Basalt	Basalt	Unknown	Unknown	Unknown	Uknown	Uknown	Uknown	Uknown	Uknown	Uknown	Uknown	Uknown
Chemical Group	**Chem Name**	**Units**	**EQL**	ANZECC 2000 MW 90%														
	Hexachlorobutadiene	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
SVOCs	1,2,3,4-tetrachlorobenzene	µg/L	1		-	<5	-	-	<5	-	-	-	-	-	-	-	-	-
	1,2,3,5-Tetrachlorobenzene	µg/L	1		-	<5	-	-	<5	-	-	-	-	-	-	-	-	-
	1,2,4,5-tetrachlorobenzene	µg/L	1		-	<5	-	-	<5	-	-	-	-	-	-	-	-	-
	1,3,5-Trichlorobenzene	µg/L	1		-	<5	-	-	<5	-	-	-	-	-	-	-	-	-
	1-Chloronaphthalene	µg/L	1		-	<5	-	-	<5	-	-	-	-	-	-	-	-	-
	1-naphthylamine	µg/L	1		-	<5	-	-	<5	-	-	-	-	-	-	-	-	-
	2-naphthylamine	µg/L	1		-	<5	-	-	<5	-	-	-	-	-	-	-	-	-
	2-nitroaniline	µg/L	1		-	<5	-	-	<5	-	-	-	-	-	-	-	-	-
	3,3-Dichlorobenzidine	µg/L	1		-	<5	-	-	<5	-	-	-	-	-	-	-	-	-
	4-(dimethylamino) azobenzene	µg/L	1		-	<5	-	-	<5	-	-	-	-	-	-	-	-	-
	4,6-Dinitro-2-methylphenol	µg/L	5		-	<30	-	-	<30	-	-	-	-	-	-	-	-	-
	7,12-dimethylbenz(a)anthracene	µg/L	1		-	<5	-	-	<5	-	-	-	-	-	-	-	-	-
	Aniline	µg/L	1		-	<5	-	-	<5	-	-	-	-	-	-	-	-	-
	Benzyl chloride	µg/L	1		-	<5	-	-	<5	-	-	-	-	-	-	-	-	-
	Dibenz(a,j)acridine	µg/L	1		-	<5	-	-	<5	-	-	-	-	-	-	-	-	-
	Diphenylamine	µg/L	1		-	<5	-	-	<5	-	-	-	-	-	-	-	-	-
	Hexachlorocyclopentadiene	µg/L	1		-	<5	-	-	<5	-	-	-	-	-	-	-	-	-
	N-nitrosodi-n-butylamine	µg/L	1		-	<5	-	-	<5	-	-	-	-	-	-	-	-	-
	N-nitrosopiperidine	µg/L	1		-	<5	-	-	<5	-	-	-	-	-	-	-	-	-
	Pentachlorobenzene	µg/L	1		-	<5	-	-	<5	-	-	-	-	-	-	-	-	-
	Trifluralin	µg/L	1		-	<5	-	-	<5	-	-	-	-	-	-	-	-	-
	4-bromophenyl phenyl ether	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
	4-chlorophenyl phenyl ether	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
	Bis(2-chloroethoxy) methane	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
	Bis(2-chloroisopropyl) ether	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
	Dibenzofuran	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
	Hexachloroethane	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
	N-nitrosodi-n-propylamine	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
Phthalates	Bis(2-ethylhexyl) phthalate	mg/L	0.001		-	<0.005	-	-	0.007	-	-	-	-	-	-	-	-	-
	Butyl benzyl phthalate	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
	Diethylphthalate	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
	Dimethyl phthalate	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
	Di-n-butyl phthalate	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
	Di-n-octyl phthalate	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
Chlorinated Hydrocarbons	2-chloronaphthalene	µg/L	1		-	<5	-	-	<5	-	-	-	-	-	-	-	-	-
Explosives	2,4-Dinitrotoluene	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
	2,6-dinitrotoluene	mg/L	0.001		-	<0.005	-	-	<0.005	-	-	-	-	-	-	-	-	-
	Nitrobenzene	mg/L	0.05		-	<0.05	-	-	<0.05	-	-	-	-	-	-	-	-	-
Herbicides	Pronamide	µg/L	1		-	<5	-	-	<5	-	-	-	-	-	-	-	-	-
Nitroaromatics	2-Picoline	µg/L	1		-	<5	-	-	<5	-	-	-	-	-	-	-	-	-
	4-aminobiphenyl	µg/L	1		-	<5	-	-	<5	-	-	-	-	-	-	-	-	-
	Pentachloronitrobenzene	µg/L	1		-	<5	-	-	<5	-	-	-	-	-	-	-	-	-

Appendix B3
Table 5
Analytical Results of the Leachate

				Location Code	Pump 1	PUMP 1	PUMP 1	Pump 2	PUMP 2	PUMP 2	Pump 3	PUMP 3	PUMP 3	Pump 4	PUMP 4	PUMP 4
				Sampled Date	29/04/2016	20/05/2016	11/07/2016	29/04/2016	20/05/2016	11/07/2016	29/04/2016	20/05/2016	11/07/2016	29/04/2016	20/05/2016	11/07/2016
				Field ID	PUMP 1	PUMP 1	PUMP 1	PUMP 2	PUMP 2	PUMP 2	PUMP 3	PUMP 3	PUMP 3	PUMP 4	PUMP 4	PUMP 4
				Sample Code	M16-My00244	M16-My22707	Z16-JI08166	M16-My00245	M16-My22708	Z16-JI08167	M16-My00246	M16-My22709	Z16-JI08168	M16-My00247	M16-My22710	Z16-JI08169
				Lab Report Number	498713	501583	507574	498713	501583	507574	498713	501583	507574	498713	501583	507574
				ANZECC 2000 MW 90%												
Chem Group	**Chem Name**	**Units**	**EQL**													
Field	ORP	mV			-	53.4	-	-	64.4	-	-	-25.1	-	-	-36.6	-
	Dissolved Oxygen (Field) (Filtered)	mg/L			0.23	0.103	-	0.108	0.046	-	0.074	0.046	-	0.2	0.12	-
	Temp (Field)	oC			19.9	19.2	-	19.8	19.1	-	18.3	16	-	18.3	18.8	-
	pH (Field)	pH_Units			7.33	6.78	-	7.25	7.08	-	6.6	6.5	-	6.64	6.52	-
	Electrical Conductivity (Field)	uS/cm			1654	1784	-	2054	2056	-	2008	2043	-	1686	1713	-
Metals	Aluminium	mg/L	0.05		<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-
	Aluminium (Filtered)	mg/L	0.05		-	-	<0.05	-	-	<0.05	-	-	<0.05	-	-	<0.05
	Antimony	mg/L	0.005		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-
	Antimony (Filtered)	mg/L	0.005		-	-	<0.005	-	-	<0.005	-	-	0.006	-	-	<0.005
	Arsenic	mg/L	0.001		0.002	0.017	-	0.002	0.007	-	0.002	0.004	-	0.002	0.004	-
	Arsenic (Filtered)	mg/L	0.001		-	-	0.003	-	-	0.006	-	-	0.004	-	-	0.003
	Barium	mg/L	0.02		0.32	0.74	-	0.33	0.45	-	0.26	0.47	-	0.24	0.38	-
	Barium (Filtered)	mg/L	0.02		-	-	0.61	-	-	0.5	-	-	0.48	-	-	0.31
	Boron	mg/L	0.05		3.5	3.1	-	3.3	3.4	-	2.8	2.9	-	2.3	2.3	-
	Boron (Filtered)	mg/L	0.05		-	-	3.6	-	-	4.4	-	-	3.5	-	-	1.7
	Cadmium	mg/L	0.0002	0.014	<0.0002	<0.0002	-	<0.0002	<0.0002	-	<0.0002	<0.0002	-	<0.0002	<0.0002	-
	Cadmium (Filtered)	mg/L	0.0002	0.014	-	-	<0.0002	-	-	<0.0002	-	-	<0.0002	-	-	<0.0002
	Chromium (III+VI)	mg/L	0.001	0.02	<0.001	0.004	-	0.001	0.003	-	<0.001	0.004	-	<0.001	0.003	-
	Chromium (III+VI) (Filtered)	mg/L	0.001	0.02	-	-	0.001	-	-	0.002	-	-	0.003	-	-	<0.001
	Cobalt	mg/L	0.001	0.014	0.003	0.003	-	0.003	0.002	-	0.002	0.002	-	0.002	0.002	-
	Cobalt (Filtered)	mg/L	0.001	0.014	-	-	0.003	-	-	0.003	-	-	0.003	-	-	0.001
	Copper	mg/L	0.001	0.003	<0.001	0.001	-	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	-
	Copper (Filtered)	mg/L	0.001	0.003	-	-	0.002	-	-	<0.001	-	-	0.002	-	-	0.002
	Iron	mg/L	0.05		<0.05	36	-	0.05	16	-	<0.05	15	-	<0.05	30	-
	Iron (Filtered)	mg/L	0.05		-	-	0.86	-	-	0.31	-	-	1	-	-	25
	Lead	mg/L	0.001	0.0066	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	-
	Lead (Filtered)	mg/L	0.001	0.0066	-	-	<0.001	-	-	<0.001	-	-	<0.001	-	-	<0.001
	Lithium	mg/L	0.005		0.007	0.007	-	0.008	0.009	-	0.007	0.009	-	0.007	0.007	-
	Lithium (Filtered)	mg/L	0.005		-	-	0.007	-	-	0.015	-	-	0.017	-	-	0.008
	Manganese	mg/L	0.005		0.44	0.48	-	0.37	0.41	-	0.42	0.47	-	0.49	0.46	-
	Manganese (Filtered)	mg/L	0.005		-	-	0.48	-	-	0.49	-	-	0.5	-	-	0.52
	Molybdenum	mg/L	0.005		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-
	Molybdenum (Filtered)	mg/L	0.005		-	-	<0.005	-	-	<0.005	-	-	<0.005	-	-	<0.005
	Nickel	mg/L	0.001	0.2	0.004	0.005	-	0.006	0.006	-	0.004	0.005	-	0.003	0.003	-
	Nickel (Filtered)	mg/L	0.001	0.2	-	-	0.007	-	-	0.005	-	-	0.006	-	-	0.002
	Phosphorus	mg/L	0.5		<0.5	-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-
	Selenium	mg/L	0.001		<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	-
	Selenium (Filtered)	mg/L	0.001		-	-	<0.001	-	-	<0.001	-	-	<0.001	-	-	<0.001
	Silver	mg/L	0.005	0.0018	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-
	Silver (Filtered)	mg/L	0.005	0.0018	-	-	<0.005	-	-	<0.005	-	-	<0.005	-	-	<0.005
	Strontium (Filtered)	mg/L	0.005		-	-	1.2	-	-	1.3	-	-	1.3	-	-	0.81
	Thallium	mg/L	0.001		<0.001	<0.005	-	<0.001	<0.005	-	<0.001	<0.005	-	<0.001	<0.005	-
	Thallium (Filtered)	mg/L	0.001		-	-	<0.001	-	-	<0.001	-	-	<0.001	-	-	<0.001
	Tin	mg/L	0.005		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-
	Tin (Filtered)	mg/L	0.005		-	-	<0.005	-	-	<0.005	-	-	<0.005	-	-	<0.005
	Uranium	mg/L	0.005		<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-
	Uranium (Filtered)	mg/L	0.005		-	-	<0.005	-	-	<0.005	-	-	<0.005	-	-	<0.005
	Vanadium	mg/L	0.005	0.16	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-
	Vanadium (Filtered)	mg/L	0.005	0.16	-	-	<0.005	-	-	<0.005	-	-	<0.005	-	-	<0.005
	Zinc	mg/L	0.001	0.023	0.015	0.18	-	0.012	0.017	-	0.005	0.01	-	0.001	0.007	-
	Zinc (Filtered)	mg/L	0.001	0.023	-	-	0.027	-	-	0.01	-	-	0.014	-	-	0.018
TPH	C7-C9	mg/L	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	C10 - C14	mg/L	0.2		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	C15-C36	mg/L	0.4		<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
	C7-C36	mg/L	0.7		<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7
PAH	PAHs (Sum of Total) - Calc	µg/L			<21	<21	<21	<21	<21	<21	<21	<21	<25	<26	<21	<21
	Benzo[b+j]fluoranthene	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Pyrene	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Carcinogenic PAHs (as B(a)P TEQ) - Calc	µg/L			<2.42	<2.42	<2.42	<2.42	<2.42	<2.42	<2.42	<2.42	<2.42	<2.42	<2.42	<2.42
	Acenaphthene	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Acenaphthylene	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Anthracene	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Benz(a)anthracene	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Benzo(a) pyrene	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Benzo(k)fluoranthene	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Benzo(g,h,i)perylene	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Chrysene	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Dibenz(a,h)anthracene	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Fluoranthene	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Fluorene	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Indeno(1,2,3-c,d)pyrene	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Naphthalene	mg/L	0.001	0.09	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	Phenanthrene	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
TOC	TOC	mg/L	5		89	-	-	69	-	-	71	-	-	59	-	-

Appendix B3
Table 5
Analytical Results of the Leachate

				Location Code	Pump 1	PUMP 1	PUMP 1	Pump 2	PUMP 2	PUMP 2	Pump 3	PUMP 3	PUMP 3	Pump 4	PUMP 4	PUMP 4
				Sampled Date	29/04/2016	20/05/2016	11/07/2016	29/04/2016	20/05/2016	11/07/2016	29/04/2016	20/05/2016	11/07/2016	29/04/2016	20/05/2016	11/07/2016
				Field ID	PUMP 1	PUMP 1	PUMP 1	PUMP 2	PUMP 2	PUMP 2	PUMP 3	PUMP 3	PUMP 3	PUMP 4	PUMP 4	PUMP 4
				Sample Code	M16-My00244	M16-My22707	Z16-JI08166	M16-My00245	M16-My22708	Z16-JI08167	M16-My00246	M16-My22709	Z16-JI08168	M16-My00247	M16-My22710	Z16-JI08169
				Lab Report Number	498713	501583	507574	498713	501583	507574	498713	501583	507574	498713	501583	507574
				ANZECC 2000 MW 90%												
Chem Group	**Chem Name**	**Units**	**EQL**													
Nutrients	Ammonia as N	mg/L	0.01	1.2	57	-	-	70	-	-	70	-	-	59	-	-
	Nitrate (as N)	mg/L	0.02		0.07	-	-	0.28	-	-	0.02	-	-	0.29	-	-
	Phosphate total (P)	mg/L	0.05		-	0.14	-	-	0.13	-	-	0.1	-	-	0.07	-
	Sulphate as S	mg/L	5		<5	-	-	<5	-	-	<5	-	-	<5	-	-
Alkalinity	Alkalinity (total) as CaCO3	mg/L	20		1300	-	-	1100	-	-	1000	-	-	910	-	-
	Alkalinity (Bicarbonate as CaCO3)	mg/L	20		1300	-	-	1100	-	-	1000	-	-	910	-	-
	Carbonate Alkalinity (as CaCO3)	mg/L	10		<10	-	-	<10	-	-	<10	-	-	<10	-	-
Major Ions	Calcium	mg/L	0.5		120	-	-	98	-	-	95	-	-	97	-	-
	Calcium (Filtered)	mg/L	0.5		-	-	120	-	-	120	-	-	110	-	-	86
	Chloride	mg/L	1		180	-	-	350	-	-	270	-	-	210	-	-
	Magnesium	mg/L	0.5		59	-	-	48	-	-	45	-	-	41	-	-
	Magnesium (Filtered)	mg/L	0.5		-	-	67	-	-	59	-	-	46	-	-	35
	Potassium	mg/L	0.5		29	-	-	37	-	-	29	-	-	25	-	-
	Potassium (Filtered)	mg/L	0.5		-	-	37	-	-	72	-	-	66	-	-	24
	Sodium	mg/L	0.5		160	-	-	170	-	-	170	-	-	140	-	-
	Sodium (Filtered)	mg/L	0.5		-	-	160	-	-	180	-	-	130	-	-	120
OC Pesticides	Aldrin + Dieldrin - Calc	µg/L			<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	Chlordane (Sumof Total) - Calc	µg/L			<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	OCPs (Sum of Total) - Calc	µg/L			<12.1	<12.1	<3.1	<12.1	<12.1	<3.1	<12.1	<12.1	<3.2	<12.1	<12.1	<3.2
	Toxaphene	µg/L	10		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
	2,4 DDD	mg/L	0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	2,4 DDE	mg/L	0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	2,4 DDT	mg/L	0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	4,4 DDD	mg/L	0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	4,4 DDE	mg/L	0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	4,4 DDT	mg/L	0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	a-BHC	mg/L	0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Aldrin	mg/L	0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	b-BHC	mg/L	0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	chlordane	mg/L	0.001		<0.01	<0.01	<0.001	<0.01	<0.01	<0.001	<0.01	<0.01	<0.001	<0.01	<0.01	<0.001
	Chlordane (cis)	mg/L	0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Chlordane (trans)	mg/L	0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	d-BHC	mg/L	0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	DDT + DDD + DDE - Calc	mg/L			<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
	Dieldrin	mg/L	0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Endosulfan I	mg/L	0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Endosulfan II	mg/L	0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002
	Endosulfan sulphate	mg/L	0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Endrin	mg/L	0.0001	0.00001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Endrin aldehyde	mg/L	0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.0001	<0.0001
	Endrin ketone	mg/L	0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001
	g-BHC (Lindane)	mg/L	0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Heptachlor	mg/L	0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Heptachlor epoxide	mg/L	0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Hexachlorobenzene	mg/L	0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Methoxychlor	mg/L	0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Phenols	2,3,4,6-tetrachlorophenol	µg/L	10		<10	<10	<10	<10	<10	<10	<10	<10	<10	<20	<10	<10
	2,4-dinitrophenol	µg/L	1		<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30
	2,6-dichlorophenol	µg/L	3		<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
	3-methylcholanthrene	µg/L	1		<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<5	<5
	4-nitrophenol	µg/L	1		<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30
	Acetophenone	µg/L	1		<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<5	<5
	Phenols (Sum of Total) - Calc	µg/L			<168	<168	<168	<168	<168	<170	<168	<168	<168	<178	<168	<168
	2,4,5-trichlorophenol	mg/L	0.001		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	2,4,6-trichlorophenol	mg/L	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	2,4-dichlorophenol	mg/L	0.001		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	2,4-dimethylphenol	mg/L	0.001		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	2-chlorophenol	mg/L	0.003		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	2-methylnaphthalene	mg/L	0.001		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005
	2-methylphenol	mg/L	0.003		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	2-nitrophenol	mg/L	0.005		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	3-&4-methylphenol	mg/L	0.006		<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
	4-chloro-3-methylphenol	mg/L	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Pentachlorophenol	mg/L	0.01	0.033	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Phenol	mg/L	0.003	0.52	<0.003	<0.003	<0.003	<0.003	<0.003	<0.005	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
VOCs	1,2,3-trichlorobenzene	µg/L	1		<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<5	<5
	1,2,4-trichlorobenzene	mg/L	0.001	0.14	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005
	1,2-dichlorobenzene	mg/L	0.001		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005
	1,3-dichlorobenzene	mg/L	0.001		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005
	1,4-dichlorobenzene	mg/L	0.001		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005
	Hexachlorobutadiene	mg/L	0.001		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005
SVOCs	1,2,3,4-tetrachlorobenzene	µg/L	1		<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<5	<5
	1,2,3,5-Tetrachlorobenzene	µg/L	1		<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<5	<5
	1,2,4,5-tetrachlorobenzene	µg/L	1		<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<5	<5

Appendix B3
Table 5
Analytical Results of the Leachate

				Location Code	Pump 1	PUMP 1	PUMP 1	Pump 2	PUMP 2	PUMP 2	Pump 3	PUMP 3	PUMP 3	Pump 4	PUMP 4	PUMP 4
				Sampled Date	29/04/2016	20/05/2016	11/07/2016	29/04/2016	20/05/2016	11/07/2016	29/04/2016	20/05/2016	11/07/2016	29/04/2016	20/05/2016	11/07/2016
				Field ID	PUMP 1	PUMP 1	PUMP 1	PUMP 2	PUMP 2	PUMP 2	PUMP 3	PUMP 3	PUMP 3	PUMP 4	PUMP 4	PUMP 4
				Sample Code	M16-My00244	M16-My22707	Z16-JI08166	M16-My00245	M16-My22708	Z16-JI08167	M16-My00246	M16-My22709	Z16-JI08168	M16-My00247	M16-My22710	Z16-JI08169
				Lab Report Number	498713	501583	507574	498713	501583	507574	498713	501583	507574	498713	501583	507574
				ANZECC 2000 MW 90%												
Chem Group	**Chem Name**	**Units**	**EQL**													
	1,3,5-Trichlorobenzene	µg/L	1		<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<5	<5
	1-Chloronaphthalene	µg/L	1		<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<5	<5
	1-naphthylamine	µg/L	1		<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<5	<5
	2-naphthylamine	µg/L	1		<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<5	<5
	2-nitroaniline	µg/L	1		<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<5	<5
	3,3-Dichlorobenzidine	µg/L	1		<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<5	<5
	4-(dimethylamino) azobenzene	µg/L	1		<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<5	<5
	4,6-Dinitro-2-methylphenol	µg/L	5		<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30
	7,12-dimethylbenz(a)anthracene	µg/L	1		<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<5	<5
	Aniline	µg/L	1		<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<5	<5
	Benzyl chloride	µg/L	1		<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<5	<5
	Dibenz(a.j)acridine	µg/L	1		<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<5	<5
	Diphenylamine	µg/L	1		<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<5	<5
	Hexachlorocyclopentadiene	µg/L	1		<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<5	<5
	N-nitrosodi-n-butylamine	µg/L	1		<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<5	<5
	N-nitrosopiperidine	µg/L	1		<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<5	<5
	Pentachlorobenzene	µg/L	1		<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<5	<5
	Trifluralin	µg/L	1		<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<5	<5
	4-bromophenyl phenyl ether	mg/L	0.001		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005
	4-chlorophenyl phenyl ether	mg/L	0.001		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005
	Bis(2-chloroethoxy) methane	mg/L	0.001		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005
	Bis(2-chloroisopropyl) ether	mg/L	0.001		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005
	Dibenzofuran	mg/L	0.001		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005
	Hexachloroethane	mg/L	0.001		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005
	N-nitrosodi-n-propylamine	mg/L	0.001		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005
Phthalates	Bis(2-ethylhexyl) phthalate	mg/L	0.001		-	-	<0.005	-	-	<0.005	-	-	<0.005	-	-	<0.005
	Butyl benzyl phthalate	mg/L	0.001		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005
	Diethylphthalate	mg/L	0.001		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005
	Dimethyl phthalate	mg/L	0.001		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005
	Di-n-butyl phthalate	mg/L	0.001		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005
	Di-n-octyl phthalate	mg/L	0.001		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005
Chlorinated Hydr	2-chloronaphthalene	µg/L	1		<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<5	<5
Explosives	2,4-Dinitrotoluene	mg/L	0.001		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005
	2,6-dinitrotoluene	mg/L	0.001		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005
	Nitrobenzene	mg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Herbicides	Pronamide	µg/L	1		<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<5	<5
Nitroaromatics	2-Picoline	µg/L	1		<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<5	<5
	4-aminobiphenyl	µg/L	1		<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<5	<5
	Pentachloronitrobenzene	µg/L	1		<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<5	<5

Appendix B4 – Map showing Council Groundwater Monitoring Wells

GIS@beca.com

Scale: 1:10,000

0 45 90 180 270 360

Metres

Waikaraka West

Waikaraka East South

Waikaraka East North

BH1B

BH1A

Pump Station 1

BH1/1A

Pump Station 2

BH2/2A

Pump Station 3

BH4/4A

Pump Station 4

Legend

Leachate Monitoring

DRAFT

FOR ASSESSMENT

13/09/2016

PRELIMINARY

No	Issued Status	Drawn	Check'd	App'd	Date
A	ISSUED FOR INFORMATION ONLY	BAP	Draft	Draft	13/09/2016

DISCLAIMER

The information shown on this drawing is solely for the purpose of supporting application under the RMA for resource consents and/ or designations.

All information shown is subject to final design and review for compliance with any approved consents and/ or designations.

This Drawing must not be used for construction.

NZ TRANSPORT AGENCY WAKA KOTAHI

East West Link

Drawn	Drafting Check	Reviewed Design Manager	Approved Alliance Manager
Designed	Design Check		
Scale: 1:10,000	Original Size: A3	Contract No PA4041	

Drawing Title: WATER QUALITY Council Groundwater Monitoring Wells

Drawing Number: GIS-AEE-WQ-002

Rev No. A

Plot Date: 13/09/2016 Plotted by: Ben Peyton

File: \\192.168.100.9\Data\CAD\ArcGIS\TGI\55_Workspaces\01_mxd\Water Quality (WQ)\DRAFTS\GIS-WQ-AEE-002_GroundWaterSamplingLocations.mxd